

Prep Standard - Chemical Standard Summary

Order ID : Test :	P4460 Mercury	y,Metals ICP-TAL							
Prepbatch ID :		39,PB164322,PB164347,PB164407,							
Sequence ID/Qc	Batch ID:	LB133043,LB133086,LB133110,LB133110,LB133110,LB133129,LB133257,							
Standard ID : MP81119,MP821	Standard ID : MP81119,MP82127,MP82441,MP82441 MP82476 MP82477 MP82478 MP82479								

MP82712,MP82485,MP82486,MP82486 MP82487,MP82488,MP82491,MP82491 MP82492,MP82652,MP82654,MP82711,MP828352,MP82838,MP82839,MP82841,MP82842,MP82843,MP82844,MP82 845,MP82846,MP82847,MP82848,MP82849,MP82850,MP82851,MP82864,MP82909,MP82910,MP82912,MP82913,M P82914,MP82915,MP82916,MP82917,MP82918,MP82919,MP82920,MP82921,MP82922,MP82924,

Chemical ID :

M4371,M4583,M4916,M4960,M5062,M5130,M5192,M5218,M5223,M5288,M5295,M5296,M5390,M5394,M5429,M5467 ,M5498,M5501,M5515,M5585,M5634,M5658,M5697,M5698,M5747,M5748,M5769,M5798,M5799,M5800,M5801,M580 2,M5806,M5814,M5815,M5816,M5817,M5818,M5819,M5820,M5875,M5882,M5935,M5953,M5962,M5963,M5970,M59 78,M5982,M5984,M6000,M6009,M6021,M6023,M6028,M6030,M6033,M6034,M6037,M6040,M6090,M6093,M6094,M6 097,mp82485,W2606,W3112,



Recipe ID 169	NAME 1:1HNO3	<u>NO.</u> MP81119	<u>Prep Date</u> 06/21/2024	Expiration Date 04/24/2025	<u>Prepared</u> <u>By</u> Al-Terek Isaac	<u>ScaleID</u> METALS_SCA LE_2 (M SC-2)	ETTE_1 (ICP	Sarabjit Jaswal
<u>FROM</u>	1250.00000ml of M5935 + 1250.000	00ml of W26	606 = Final Q	uantity: 2500.0			A)	
Recipe				Expiration	Prepared			Supervised By

<u>Recipe</u> <u>ID</u> 170	NAME 1:1HCL	<u>NO.</u> MP82127	<u>Prep Date</u> 09/03/2024	Expiration Date 02/08/2025	<u>Prepared</u> <u>By</u> Janvi Patel	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
FROM	1250.00000ml of M6040 + 1250.0000	l 00ml of W31	l 12 = Final Qi	uantity: 2500.00	00 ml			09/03/2024



Recipe ID 902	NAME ICP AES CAL BLK (SO/ICB/CCB)	<u>NO.</u> MP82441	Prep Date 09/23/2024	Expiration Date 10/30/2024	<u>Prepared</u> <u>By</u> Kareem Khairalla	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
FROM	125.00000ml of M6040 + 2350.0000	Dml of W311	2 + 25.00000	ml of M6037 =	Final Quantity:	2500.000 ml		

Recipe ID 912	NAME ICP AES ICV SOLN	<u>NO.</u> <u>MP82485</u>	Prep Date 09/24/2024	Expiration Date 10/30/2024	<u>Prepared</u> <u>By</u> Kareem Khairalla	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
FROM	0.02500ml of M5429 + 0.02500ml of of M5295 + 89.77500ml of MP82441)ml of M5982 +	0.25000ml of M	5218 + 10.000	



Recipe ID 904	NAME ICP AES ICSA SOLN	<u>NO.</u> MP82486	Prep Date 09/24/2024	Expiration Date 10/30/2024	<u>Prepared</u> <u>By</u> Kareem Khairalla	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
<u>FROM</u>	25.00000ml of M5130 + 225.00000m	l of MP8244	1 = Final Qu	antity: 250.000	ml			

<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By
911	ICP AES CCV SOLN	<u>MP82488</u>	09/24/2024	10/30/2024	Kareem Khairalla	None	None	Sarabjit Jaswal 09/24/2024
FROM	50.00000ml of MP82441 + 50.00000	I mI of MP82₄	1 476 = Final Q	uantity: 100.00				00.2 2021



Recipe ID 919	NAME ICP AES INTERNAL STD	<u>NO.</u> MP82491	Prep Date 09/24/2024	Expiration Date 10/30/2024	Prepared By Kareem Khairalla	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
<u>FROM</u>	1.00000ml of M5984 + 10.00000ml o	f M4960 + 1	969.00000ml	of W3112 + 20		963 = Final Qu	antity: 2000.00	
								0 · · · 10

Recipe				Expiration	<u>Prepared</u>			Supervised By
ID	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Sarabjit Jaswal
65	POTASSIUM PERMANGANATE	<u>MP82652</u>	09/30/2024	04/03/2025	Mohan Bera	METALS_SCA		
	SOLUTION 5 %					LE_3 (M SC-3)		10/04/2024
FROM	100.00000gram of M4916 + 2000.00	000ml of W	3112 = Final (Quantity: 2000.	000 ml			
	-			-				



Recipe ID 67	NAME SODIUM CHLORIDE - HYDROXYL- CHLORIDE	<u>NO.</u> MP82654	<u>Prep Date</u> 09/30/2024	Expiration Date 04/03/2025		<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)		Sarabjit Jaswal
<u>FROM</u>	SOLUTION 2000.00000ml of W3112 + 240.0000	Ogram of M4	1371 + 240.00	0000gram of M5	5501 = Final Qı	uantity: 2000.000	D ml	
Recipe	NAME	NO	Dran Data	Expiration	Prepared	SeelalD	BinettelD	Supervised By

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Sarabjit Jaswal
2950	ICP AES S1/CRI STOCK STD	<u>MP82711</u>	10/07/2024	10/31/2024	Kareem	None	None	-
					Khairalla			10/07/2024
FROM	0.00300ml of M6028 + 0.03000ml of of M6033 + 0.06000ml of M5747 + 0. 0.10000ml of M5962 + 0.10000ml of of M5799 + 0.20000ml of M5819 + 0. 0.50000ml of M5390 + 0.50000ml of of M5769 + 1.00000ml of M5806 + 1. MP82441 = Final Quantity: 100.000	10000ml of M5970 + 0. 20000ml of M5814 + 1. 00000ml of	M5697 + 0.10 10000ml of M M6021 + 0.20 00000ml of M	0000ml of M569 5982 + 0.15000 0000ml of M602 5192 + 1.00000	98 + 0.10000ml 0ml of M5800 + 23 + 0.25000ml 0ml of M5288 +	of M5801 + 0.1 0.20000ml of M of M5467 + 0.2 1.00000ml of M	0000ml of M58 15748 + 0.2000 5000ml of M58 15498 + 1.0000	320 + 00ml 302 +



Recipe ID 871	NAME MERCURY INTERMEDIATE B 250PPB WORKING STD.	<u>NO.</u> MP82838	Prep Date 10/21/2024	Expiration Date 10/22/2024	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
FROM	11.00000ml of M6090 + 2.50000ml o	f M5062 + 9	6.50000ml of	W3112 = Fina	Quantity: 100.0	000 ml	A)	
		1						

<u>Recipe</u> <u>ID</u> 1340	NAME Hg 0.00 PPB STD	<u>NO.</u> MP82839	Prep Date 10/21/2024	Expiration Date 10/22/2024	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
FROM	2.50000ml of M6090 + 247.50000ml	of W3112 =	Final Quantii	ty: 250.000 ml	<u> </u>		<u>A)</u>	



Recipe ID 1341 FROM	NAME Hg 0.2 PPB STD 2.50000ml of M6090 + 247.30000ml	<u>NO.</u> <u>MP82841</u> of W3112 +	Prep Date 10/21/2024 0.20000ml of	Expiration Date 10/22/2024 MP82838 = F	Prepared By Mohan Bera inal Quantity: 25	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 10/21/2024
<u>Recipe</u> <u>ID</u> 1342	NAME Hg 2.5 PPB STD	<u>NO.</u> MP82842	Prep Date 10/21/2024	Expiration Date 10/22/2024	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	Sarabjit Jaswal
FROM	2.50000ml of M6090 + 245.00000ml	of W3112 +	2.50000ml of	MP82838 = F	inal Quantity: 25	50.000 ml	<u>A)</u>	



Recipe ID 1343 FROM	NAME Hg 5.0 PPB STD 2.50000ml of M6090 + 242.50000ml	<u>NO.</u> <u>MP82843</u> of W3112 +	Prep Date 10/21/2024 5.00000ml of	Expiration Date 10/22/2024 MP82838 = Fi	Prepared By Mohan Bera nal Quantity: 25		PipettelD METALS_PIP ETTE_5 (HG A)	Supervised By Sarabjit Jaswal 10/21/2024
Recipe <u>ID</u> 1344	NAME Hg 7.5 PPB STD	<u>NO.</u> MP82844	Prep Date 10/21/2024	Expiration Date 10/22/2024	Prepared By Mohan Bera	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_5 (HG	Sarabjit Jaswal



Recipe ID 1345	NAME Hg 10.0 PPB STD	<u>NO.</u> MP82845	Prep Date 10/21/2024	Expiration Date 10/22/2024	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	Sarabjit Jaswal
<u>FROM</u>	2.50000ml of M6090 + 237.50000ml	of W3112 +	10.00000ml c	of MP82838 =	Final Quantity: 2	250.000 ml	- <u>A</u>) -	
Recipe ID		<u>NO.</u>	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipettelD</u>	<u>Supervised By</u> Sarabjit Jaswal

									Galabjit Gaswal
1346	Hg ICV SOLUTION	<u>MP82846</u>	10/21/2024	10/22/2024	Mohan Bera	None	METAL	S_PIP	
							ETTE_	5 (HG	10/21/2024
							Â) 	
FROM	2.50000ml of M5953 + 2.50000ml of	M6090 + 24	5.00000ml of	W3112 = Fina	I Quantity: 250.	000 ml			
1									



Recipe ID 1351	NAME ICB (Hg 0.00 PPB SOLUTION)	<u>NO.</u> MP82847	Prep Date 10/21/2024	Expiration Date 10/22/2024	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
FROM	2.50000ml of M6090 + 247.50000ml	of W3112 =	Final Quantit	ry: 250.000 ml			A)	
Recipe				Expiration	Prepared			Supervised By

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
1358	CCV (Hg 5.0 PPB SOLUTION)	<u>MP82848</u>	10/21/2024	10/22/2024	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	10/21/2024
FROM	485.00000ml of W3112 + 5.00000ml	of M6090 +	10.00000ml o	of MP82838 =	Final Quantity: 8	500.000 ml	- <u>A)</u>	
					-			



Recipe ID 1352	NAME CCB (Hg 0.00 PPB SOLUTION)	<u>NO.</u> MP82849	Prep Date 10/21/2024	Expiration Date 10/22/2024	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	Sarabjit Jaswal
<u>FROM</u>	495.00000ml of W3112 + 5.00000ml	of M6090 =	Final Quantit	y: 500.000 ml			A)	
<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u> Sarabjit Jaswal

<u>ID</u>	NAME	<u>NO.</u>	Prep Date	Date	<u>By</u>	<u>ScaleID</u>	PipettelD	<u>Supervised by</u>
								Sarabjit Jaswal
1349	CRA/CRI (Hg 0.2 PPB	<u>MP82850</u>	10/21/2024	10/22/2024	Mohan Bera	None	METALS_PIP	
	SOLUTION)						ETTE_5 (HG A)	10/21/2024
FROM	2.50000ml of M6090 + 247.30000ml	of W3112 +	0.20000ml of	MP82838 = F	inal Quantity: 25	50.000 ml	A)	
<u></u>								



Recipe ID 1350 FROM	NAME CHK STD (Hg 7.0 PPB SOLUTION) 2.50000ml of M6090 + 240.50000ml	<u>NO.</u> <u>MP82851</u> of W3112 +	Prep Date 10/21/2024 7.00000ml of	Expiration Date 10/22/2024 MP82838 = F	Prepared By Mohan Bera inal Quantity: 29	ScaleID None	PipettelD METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 10/21/2024
Recipe ID 68	NAME STANNOUS CHLORIDE SOLUTION	<u>NO.</u> MP82864	Prep Date 10/22/2024	Expiration Date 10/23/2024		<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)		Sarabjit Jaswal

FROM 450.00000ml of W3112 + 50.00000gram of M5882 + 50.00000ml of M6040 = Final Quantity: 500.000 ml



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Recipe ID 871	NAME MERCURY INTERMEDIATE B 250PPB WORKING STD.	<u>NO.</u> MP82909	Prep Date 10/24/2024	Expiration Date 10/25/2024	Prepared By Mohan Bera	<u>ScaleID</u> None	PipetteID None	Sarabjit Jaswal
FROM	1.00000ml of M6097 + 2.50000ml of	M5062 + 96	50000ml of V	V3112 = Final	Quantity: 100.00	00 ml		

Recipe				Expiration	Prepared			Supervised By
ID	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
1340	Hg 0.00 PPB STD	<u>MP82910</u>	10/24/2024	10/25/2024	Mohan Bera	None	None	-
								10/26/2024
FROM	2.50000ml of M6097 + 247.50000ml	of W3112 =	Final Quanti	ty: 250.000 ml				



Recipe ID 1341 FROM	NAME Hg 0.2 PPB STD 2.50000ml of M6097 + 247.30000ml	<u>NO.</u> MP82912 of W3112 +	Prep Date 10/24/2024 0.20000ml of	Expiration Date 10/25/2024 MP82909 = F	Prepared By Mohan Bera	ScaleID None	PipetteID METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 10/26/2024
Recipe ID 1342 FROM	NAME Hg 2.5 PPB STD 2.50000ml of M6097 + 245.00000ml	<u>NO.</u> <u>MP82913</u> of W3112 +	Prep Date 10/24/2024 2.50000ml of	Expiration Date 10/25/2024 MP82909 = F	Prepared By Mohan Bera inal Quantity: 25	<u>ScaleID</u> None 50.000 ml	PipetteID METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 10/26/2024



Recipe ID 1343 FROM	NAME Hg 5.0 PPB STD 2.50000ml of M6097 + 242.50000ml	<u>NO.</u> MP82914 of W3112 +	Prep Date 10/24/2024 5.00000ml of	Expiration Date 10/25/2024 MP82909 = F	Prepared By Mohan Bera inal Quantity: 25	ScaleID None	PipetteID METALS_PIP ETTE_5 (HG A)	Supervised By Sarabjit Jaswal 10/26/2024
Recipe ID 1344 FROM	NAME Hg 7.5 PPB STD 2.50000ml of M6097 + 240.00000ml	<u>NO.</u> <u>MP82915</u> of W3112 +	Prep Date 10/24/2024 7.50000ml of	Expiration Date 10/25/2024 MP82909 = F	Prepared By Mohan Bera inal Quantity: 25	ScaleID None	PipetteID METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal



FROM

A)

Metals STANDARD PREPARATION LOG

Recipe ID 1345 FROM	NAME Hg 10.0 PPB STD 2.50000ml of M6097 + 237.50000ml	<u>NO.</u> <u>MP82916</u> of W3112 +	Prep Date 10/24/2024 10.00000ml d	Expiration Date 10/25/2024	Prepared By Mohan Bera Final Quantity: 2	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 10/26/2024
<u>Recipe</u> <u>ID</u> 1346	NAME Hg ICV SOLUTION	<u>NO.</u> MP82917	Prep Date	Expiration Date 10/25/2024	<u>Prepared</u> <u>Ву</u> Mohan Bera	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_5 (HG	Supervised By Sarabjit Jaswal 10/26/2024

2.50000ml of M5953 + 2.50000ml of M6097 + 245.00000ml of W3112 = Final Quantity: 250.000 ml



<u>Recipe</u> <u>ID</u> 1351	NAME ICB (Hg 0.00 PPB SOLUTION)	<u>NO.</u> MP82918	Prep Date 10/24/2024	Expiration Date 10/25/2024	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	Sarabjit Jaswal
<u>FROM</u>	2.50000ml of M6097 + 247.50000ml	of W3112 =	Final Quantit	y: 250.000 ml			A)	
Recipe	NAME	NO	Bron Data	Expiration	Prepared	ScalolD	PinottolD	Supervised By

Recipe				Expiration	Prepared			<u>Supervised By</u>
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	Date	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1358	CCV (Hg 5.0 PPB SOLUTION)	<u>MP82919</u>	10/24/2024	10/25/2024	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	10/26/2024
FROM	485.00000ml of W3112 + 5.00000ml	of M6097 +	10.00000ml c	of MP82909 =	Final Quantity:	500.000 ml	A)	
					-			



Recipe ID 1352	NAME CCB (Hg 0.00 PPB SOLUTION)	<u>NO.</u> <u>MP82920</u>	Prep Date 10/24/2024	Expiration Date 10/25/2024	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
<u>FROM</u>	495.00000ml of W3112 + 5.00000ml	of M6097 =	Final Quantit	y: 500.000 ml			A)	
<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u> Sarabjit Jaswal

ID	NAME	<u>NO.</u>	Prep Date	Date	By	<u>ScaleID</u>	PipettelD	Sarabjit Jaswal
1349	CRA/CRI (Hg 0.2 PPB SOLUTION)	<u>MP82921</u>	10/24/2024	10/25/2024	Mohan Bera	None	METALS_PIP ETTE_5 (HG	10/26/2024
FROM	2.50000ml of M6097 + 247.30000ml	of W3112 +	0.20000ml of	MP82909 = F	inal Quantity: 25	50.000 ml	A)	



FROM 450.00000ml of W3112 + 50.00000gram of M5882 + 50.00000ml of M6094 = Final Quantity: 500.000 ml



STOCK SOLN

CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-2196-01 / Hydroxylamine Hydrochloride, Crystal (cs/4x500g)	0000215387	06/25/2025	07/01/2019 / RICHARD	06/07/2019 / RICHARD	M4371
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Labpure	0919120 / Boiling Stones	26275770	07/07/2025	07/03/2020 / mohan	05/07/2020 / mohan	M4583
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3227-05 / Potassium Permanganate (2.5kg)	210800	03/31/2026	11/30/2022 / mohan	07/28/2021 / mohan	M4916
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGIN10-5 / INDIUM 1 x 500 ml	100721	10/07/2024	10/09/2021 / jaswal	10/08/2021 / jaswal	M4960
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	MSHG-10PPM / MERCURY HCI 125mL 10ug/mL	S2-HG709270	09/22/2026	05/28/2022 / mohan	01/27/2022 / mohan	M5062
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART A / ICSA (ICP) STOCK SOLN	ICSA-1211	11/19/2024	05/20/2024 /	04/20/2021 / bin	M5130

bin



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57042 / Mo, 1000 PPM, 125 ml	051722	05/17/2025	07/01/2022 / bin	06/17/2022 / jaswal	M5192
			<u> </u>			

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti	S2-MEB711674	11/02/2026	07/01/2022 / bin	09/10/2021 / bin	M5218

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSAB (ICP) STOCK SOLN	ICSB-0710	11/19/2024	05/20/2024 /	04/20/2021 / bin	M5223

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58119 / K, 10000 PPM, 500 ml	071122	07/11/2025	09/01/2022 / jaswal	07/21/2022 / jaswal	M5288

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV-1014	02/05/2025	08/07/2024 / jaswal	02/20/2020 / bin	M5295

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	Z9651Q / CHEM-CLP-4/.25L	S2-MEB711673	11/02/2026	09/19/2022 / jaswal	08/20/2022 / jaswal	M5296



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CHEMICAL RECEIPT LOG BOOK

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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57056 / Ba, 1000 PPM, 125 ml	072122	07/21/2025	08/07/2024 / jaswal	09/18/2022 / bin	M5390
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL	T2-MEB714159	01/13/2027	11/28/2022 / bin	09/19/2022 / bin	M5394
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57103 / Li, 10000 PPM, 125 ml	070622	07/06/2025	01/30/2023 / bin	01/26/2023 / bin	M5429
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57058 / Cerium, 1000PPM, 100ML	020623	02/06/2026	03/06/2023 / bin	03/01/2023 / bin	M5467
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	031523	03/15/2026	08/15/2023 / jaswal	03/17/2023 / bin	M5498

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3624-05 / Sodium Chloride, Crystal (cs/4x2.5kg)	0000281938	07/06/2026	07/24/2023 / mohan	04/14/2023 / mohan	M5501



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	092122	09/21/2025	08/01/2024 / Jaswal	03/17/2023 / bin	M5515
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
PCI Scientific Supply, Inc.	26397-103 / PTFE BOILING STONES	W126678	02/28/2025	01/20/2024 /	06/12/2023 / jaswal	M5585
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
PCI Scientific Supply, Inc.	1403 / Hydrogen Peroxide, 30% 1 gal	820803	02/03/2025	04/18/2024 /	08/03/2022 / Al-Terek	M5634
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58024 / Chromium, Cr, 500 ml, 1000 PPM	060523	06/05/2026	08/28/2023 / jaswal	08/25/2023 / jaswal	M5658
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	102523	10/25/2026	04/03/2024 / jaswal	10/27/2023 / jaswal	M5697
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
	58025 / Mn, 1000 PPM,	102623	10/26/2026	04/18/2024 /	10/27/2023 /	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Lead (Pb) 1000PPM	100923	10/09/2026	05/20/2024 / Jaswal	12/20/2023 / jaswal	M5747
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Nickel (Ni) 1000PPM	091223	09/12/2026	01/02/2024 / bin	12/20/2023 / jaswal	M5748
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58112 / Mg, 10000 PPM, 500 ml	091823	09/18/2026	05/24/2024 / Jaswal	01/03/2024 / bin	M5769
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57004 / Be, 1000 PPM, 125 ml	102523	10/25/2026	02/09/2024 / bin	02/09/2024 / bin	M5798
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57050 / Sn, 1000 PPM, 125 ml	071123	07/11/2026	02/09/2024 / bin	02/09/2024 / bin	M5799
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57027 / CO, 1000 PPM, 125 ml	091923	09/19/2026	05/31/2024 / bin	02/09/2024 / bin	M5800



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57033 / As, 1000 PPM, 125 ml	111323	11/13/2026	02/09/2024 / bin	02/09/2024 / bin	M5801
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	120523	12/05/2026	08/07/2024 / jaswal	01/03/2024 / jaswal	M5802
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	122223	12/22/2026	08/01/2024 / Jaswal	01/03/2024 / jaswal	M5806
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57005 / B, 1000 PPM, 125 ml	071123	07/11/2026	03/26/2024 / Sohil	01/03/2024 / jaswal	M5814
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57115 / P, 10000 PPM, 125 ml	041723	04/17/2026	05/21/2024 / Jaswal	02/09/2024 / jaswal	M5815
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57016 / S, 1000 PPM, 125 ml	122923	12/29/2026	05/20/2024 / Jaswal	02/09/2024 / jaswal	M5816



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57116 / S, 10000 PPM, 125 ml	071123	07/11/2026	03/01/2024 / jaswal	02/09/2024 / jaswal	M5817
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57014 / Si, 1000 PPM, 125 ml	122023	12/20/2026	03/06/2024 / jaswal	02/09/2024 / jaswal	M5818
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	111623	11/16/2026	03/20/2024 / jaswal	02/09/2024 / jaswal	M5819
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57015 / P, 1000 PPM, 125 ml	091123	09/11/2026	05/01/2024 / jaswal	02/09/2024 / jaswal	M5820
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-1 / CLP CAL SOLUTION #1, 125mL	T2-MEB714417	01/27/2027	04/19/2024 / jaswal	02/22/2024 / jaswal	M5875
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3980-01 / Stannous Chloride (cs/4x500g)	232820	08/31/2028	04/30/2024 / mohan	04/25/2024 / mohan	M5882



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	12/08/2024	06/21/2024 / Al-Terek	06/07/2024 / Al-Terek	M5935
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-5 / ICV (HG)STOCK SOLN	ICV5-0415	01/01/2025	07/01/2024 / mohan	03/30/2023 / mohan	M5953
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #

Supplier	itemcode / iteminame		Date	Opened By	Received By	Lot #
Absolute Standards, Inc.	57034 / Se, 1000 PPM, 125 ml	060624	06/06/2027	07/02/2024 / Jaswal	06/14/2024 / Jaswal	M5962

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24B1362001	01/04/2025	07/09/2024 / Al-Terek	07/03/2024 / Al-Terek	M5963

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57003 / Li, 1000 PPM, 125 ml	061224	06/21/2027	07/01/2024 / Jaswal	07/01/2024 / Jaswal	M5970

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGTI1-1 / TITANIUM 125mL 1000ug/mL	T2-TI719972	06/17/2027	08/07/2024 / jaswal	02/22/2024 / Jaswal	M5978
U U		12-111 13372	00,1172021			M5



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	031524	03/15/2027	07/01/2024 / Jaswal	06/11/2024 / Jaswal	M5982
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGY10-1 / YTTRIUM 125mL 10,000ug/mL	V2-Y740548	02/20/2029	08/05/2024 / kareem	06/14/2024 / Jaswal	M5984
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	WW-LFS-1 / Laboratory Fortified Stock Solution 1, 125 ml	T2-MEB723367	08/30/2026	08/13/2024 / Jaswal	05/14/2024 / Jaswal	M6000
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	WW-LFS-2 / Laboratory Fortified Stock Solution 2, 125 ml	U2-MEB731108	03/17/2028	08/13/2024 / Jaswal	05/14/2024 / Jaswal	M6009
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 ml	062424	06/24/2027	09/28/2024 / jaswal	08/05/2024 / Jaswal	M6021
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57048 / Cd, 1000 PPM, 125 ml	070124	07/01/2027	08/05/2024 / kareem	01/25/2019 / Jaswal	M6028
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57047 / Ag, 1000 PPM, 125 ml	122823	12/28/2026	08/05/2024 / kareem	08/05/2024 / Jaswal	M6030
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / AI, 10000 PPM, 500 ml	011623	01/16/2026	08/07/2024 / Jaswal	01/03/2024 / Jaswal	M6033

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	02/01/2025	08/06/2024 / Janvi	08/01/2024 / Janvi	M6034

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	02/02/2025	08/24/2024 / Janvi	08/01/2024 / Janvi	M6037

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	24D1562005	02/08/2025	08/09/2024 /	08/01/2024 / Janvi	M6040



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	03/25/2029	10/18/2024 / Janvi	09/10/2024 / Janvi	M6090
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	03/25/2029	10/21/2024 / Eman	09/10/2024 / Janvi	M6093

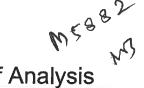
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)		04/24/2025	10/24/2024 / Janvi	10/21/2024 / Janvi	M6094

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	03/25/2029	10/24/2024 / Janvi	09/21/2024 / Janvi	M6097

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	DIW / DI Water	Daily Lab-Certified	10/24/2024	10/24/2019 / apatel	10/24/2019 / apatel	W2606

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	DIW / DI Water	Daily Lab-Certified	07/03/2029	07/03/2024 / Iwona	07/03/2024 / Iwona	W3112

Certificate of Analysis Thermo Fisher SCIENTIFIC



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Certificate of Analysis 1 Reagent Lane Fair Lawn, NJ 07410 Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System 201,796,7100 tel Standard ISO9001:2015 by SAI Global Certificate Number CERT - 0120633 201.796.1329 fax

This is to certify that units of the lot number below were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Thermo Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Products are for research use or further manufacturing. Not for direct administration to humans or animals. It is the responsibility of the final formulator and end user to determine suitability based upon the intended use of the end product. Products are tested to meet the analytical requirements of the noted grade. The following information is the actual analytical results obtained.

Catalog Number	T142	Quality Test / Release Date	08/17/2023
Lot Number	232820		
Description	STANNOUS CHLORIDE, DIH	YDRATE CERTIFIED ACS (Suitable for Me	ercury Determination)
Country of Origin	United States	Suggested Retest Date	Aug/2028
Chemical Origin	Inorganic-non animal		
BSE/TSE Comment	No animal products are used a processing aids, or any other	as starting raw material ingredients, or used material that might migrate to the finished p	in processing, including lubricants, roduct.

N/A					
Result Name	Units	Specifications	Test Value		
APPEARANCE		REPORT	Clear crystals		
ASSAY	%	Inclusive Between 98 - 103	100.65		
CALCIUM	%	<= 0.005	0.0017		
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST		
IRON (Fe)	%	<= 0.003	0.0011		
LEAD (Pb)	%	<= 0.01	0.0006		
MERCURY (Hg)	ppm	<= 0.05	<0.05		
POTASSIUM (K)	%	<= 0.005	0.0001		
SODIUM (Na)	%	<= 0.01	<0.01		
SOLUBILITY IN HCL	PASS/FAIL	= PASS TEST	PASS TEST		
SULFATE (SO4)	PASS/FAIL	= P.T. (ABOUT 0.003%)	P.T. (ABOUT 0.003%)		

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Harout Sahagian - Quality Control Supervisor - Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call at (800) 227-6701.

*Based on suggested storage condition.

m/z->	1.067	m/z-> 2.0€7	5.014	m/z-> 1.0E5	2.5E4	5. 0 114	1. Cadmium nitrate tetrahydrate (Cd)	Compound	Weight shov	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):		CERTIFIED WEIGHT REPORT:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
		 		0 0		[1] Spectrum No.1		RM#	Weight shown below was dliuted to (mL):	Expiration Date: nended Storage: ntration (µg/mL):	Part Number: Lot Number: Description:	PORT:	15, Inc. om
		120		20		-	IN024 CDM092021A1	Lot Number	6UTB uted to (mL):	070127 Ambient (20 °C) 1000	<u>57048</u> <u>070124</u> Cadmium (Cd)		
		130		30		12.514 800	1000 99.	Nominal Pu Conc. (µg/mL) (1	2000.07 0.1		(Cd)		R
200		140		\$		12.514 sec]:58148.D# [Count] [Linear]	99.999 0.10 36.5	Purity Uncertainty Assay (%) Purity (%) (%)	5E-05 Balance Uncertainty 0.100 Flask Uncertainty		Solvent: 2%		Certified R
		1 () ()		ő		Count] [Line	.5 5.4797	say Target 6) Weight (g)	ţ		ent: 24002546 2% 40.0	Lot #	Certified Reference Material CRM 3 15 12 4
		160		0 O		ar]	5.4804	Actual Actual Weight (g) Conc. (µg/mL)			Nitric Acid		terial CRM
		170		70			1000.1	11	Re	5	5		M6028
		-1 2 C		BO			10022-68-1	Expanded Uncertainty (Solvent +/- (µg/mL) CAS# 0	Reviewed By: Ped	\$	Alloch & B		-
		190 200		90 100				SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD51	Pedro L. Rentas	ento	Brack		ANAB IS AR-153 https://Ab
				-			orl-rat 60.2mg/kg 3108	hed pg.) NIST LD50 SRM	070124		070194		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

1 of 2

Part # 57048

Lot # 070124

Printed: 8/1/2024, 2:13:25 PM





https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

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Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

In P. St.

Certified by:

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST

Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

e24

M5296 OP: 09/19/2022 BH



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 **PRODUCT DESCRIPTION**

Product Code:	Multi Analyte Custom Grade Solution	n
Catalog Number:	CHEM-CLP-4	
Lot Number:	S2-MEB711673	
Matrix:	3% (v/v) HNO3 3% (v/v) HF	
Value / Analyte(s):	1 000 μg/mL ea: Boron, Silicon, Titanium	Molybdenum, Tin,

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Boron, B	CERTIFIED VALUE 1 000 ± 6 μg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 1 000 ± 6 μg/mL	
Silicon, Si	1 000 ± 7 μg/mL	Tin, Sn	1 000 ± 6 µg/mL	
Titanium, Ti	1 000 ± 7 μg/mL			
Density:	1.030 g/mL (meas	sured at 20 ± 4 °C)		
Assay Information	n:			
ANALYTE	METHOD	NIST SRM#		SRM LOT#
B	ICP Assav	3107		110830

В	ICP Assay	3107	110830
Мо	ICP Assay	3134	130418
Si	ICP Assay	3150	130912
Sn	ICP Assay	3161a	140917
Ti	ICP Assay	3162a	130925

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods Certified Value, X _{CRM/RM} , where two or more methods of characterization are	Characterization of CRM/RM by One Method Certified Value, X _{CRM/RM} , where one method of characterization
used is the weighted mean of the results:	is used is the mean of individual results:
$X_{CRM/RM} = \Sigma(w_i) (X_i)$	X _{CRM/RM} = (X _a) (u _{char a})
X _i = mean of Assay Method i with standard uncertainty u _{char i}	X _a = mean of Assay Method A with
w_i = the weighting factors for each method calculated using the inverse square of the variance: $w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$	$\mathbf{u}_{char \ a}$ = the standard uncertainty of characterization Method A
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{1/2}	CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{chara}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$
k = coverage factor = 2	k = coverage factor = 2
$\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}$ are the errors from each characterization method	u _{char a} = the errors from characterization
ubb = bottle to bottle homogeneity standard uncertainty	ubb = bottle to bottle homogeneity standard uncertainty
u _{lts} = long term stability standard uncertainty (storage)	ults = long term stability standard uncertainty (storage)
u _{te} = transport stability standard uncertainty	ute = transport stability standard uncertainty

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

4.0

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between $4^{\circ} - 24^{\circ}$ C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- November 02, 2026

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

3.0

P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade So	lution	
Catalog Number:	CLPP-CAL-1		
Lot Number:	T2-MEB714417		
Matrix:	5% (v/v) HNO3		
Value / Analyte(s):	5 000 μg/mL ea: Calcium, Magnesium,	Potassium, Sodium,	
	2 000 μg/mL ea: Aluminum,	Barium,	
	1 000 μg/mL ea: Iron,		
	500 μg/mL ea: Nickel, Zinc, Manganese,	Vanadium, Cobalt,	
	250 μg/mL ea: Silver,	Copper,	
	200 μg/mL ea: Chromium,		
	50 μg/mL ea: Beryllium		
CERTIFIED VALUE	S AND UNCERTAINTIES		

ANALYTE Aluminum, Al	CERTIFIED VALUE 2 000 ± 7 μg/mL	ANALYTE Barium, Ba	CERTIFIED VALUE 2 000 ± 9 μg/mL
Beryllium, Be	50.00 ± 0.26 μg/mL	Calcium, Ca	5 000 ± 22 μg/mL
Chromium, Cr	200.0 ± 1.0 μg/mL	Cobalt, Co	500.0 ± 2.4 μg/mL
Copper, Cu	250.0 ± 1.0 μg/mL	Iron, Fe	1 000 ± 4 μg/mL
Magnesium, Mg	5 000 ± 20 μg/mL	Manganese, Mn	500.0 ± 2.0 μg/mL
Nickel, Ni	500.0 ± 2.2 μg/mL	Potassium, K	5 000 ± 19 μg/mL
Silver, Ag	250.0 ± 1.1 μg/mL	Sodium, Na	5 000 ± 18 μg/mL
Vanadium, V	499.7 ± 2.2 μg/mL	Zinc, Zn	500.0 ± 2.2 μg/mL

Density:

1.118 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE Ag	METHOD ICP Assay	NIST SRM# 3151	SRM LOT# 160729
Ag	Volhard	999c	999c
AI	ICP Assay	3101a	140903
AI	EDTA	928	928
Ва	ICP Assay	3104a	140909
Ва	Gravimetric		See Sec. 4.2
Ве	ICP Assay	3105a	090514
Ве	Calculated		See Sec. 4.2
Са	ICP Assay	3109a	130213
Са	EDTA	928	928
Со	ICP Assay	3113	190630
Со	EDTA	928	928
Cr	ICP Assay	3112a	170630
Cr	Calculated		See Sec. 4.2
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
К	ICP Assay	3141a	140813
К	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
V	IC Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods Certified Value, X _{CRM/RM} , where two or more methods of characterization are	Characterization of CRM/RM by One Method Certified Value, X _{CRM/RM} , where one method of characterization
used is the weighted mean of the results:	is used is the mean of individual results:
$X_{CRM/RM} = \Sigma(w_i) (X_i)$	X _{CRM/RM} = (X _a) (u _{char a})
X _i = mean of Assay Method i with standard uncertainty u _{char i}	X _a = mean of Assay Method A with
w_i = the weighting factors for each method calculated using the inverse square of the variance: $w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$	u _{char} a = the standard uncertainty of characterization Method A
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{1/2}	CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² char a + u ² bb + u ² lts + u ² ts) ¹
k = coverage factor = 2	k = coverage factor = 2
$\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}$ are the errors from each characterization method	u _{char a} = the errors from characterization
ubb = bottle to bottle homogeneity standard uncertainty	u _{bb} = bottle to bottle homogeneity standard uncertainty
u _{lts} = long term stability standard uncertainty (storage)	ults = long term stability standard uncertainty (storage)
u _{te} = transport stability standard uncertainty	ute = transport stability standard uncertainty

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

4.0

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° \pm 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Note: This solution contains Silver (Ag), please refer to our Sample Preparation Guide for more information.

https://www.inorganicventures.com/sample-preparation-guide/samples-containing-silver

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

 This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 27, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- January 27, 2027

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

SD978Ci Paul R Saines



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 **PRODUCT DESCRIPTION**

Product Code:	Multi Analyte Custom Grade Solution		
Catalog Number:	CLPP-CAL-3		
Lot Number:	T2-MEB714159		
Matrix:	7% (v/v) HNO3		
Value / Analyte(s):	1 000 μg/mL ea: Arsenic, Selenium,	Lead, Thallium,	
	500 μg/mL ea: Cadmium		

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Arsenic, As	CERTIFIED VALUE 1 000 ± 8 µg/mL	ANALYTE Cadmium, Cd	CERTIFIED VALUE 500.0 ± 2.1 μg/mL
Lead, Pb	1 000 ± 5 μg/mL	Selenium, Se	1 000 ± 8 μg/mL
Thallium, Tl	1 000 ± 7 μg/mL		

Density:

1.043 g/mL (measured at 20 \pm 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
As	ICP Assay	3103a	100818
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Se	ICP Assay	3149	100901
ТІ	ICP Assay	3158	151215

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods Certified Value, X _{CRM/RM} , where two or more methods of characterization are	Characterization of CRM/RM by One Method Certified Value, X _{CRM/RM} , where one method of characterization
used is the weighted mean of the results:	is used is the mean of individual results:
$X_{CRM/RM} = \Sigma(w_i) (X_i)$	X _{CRM/RM} = (X _a) (u _{char a})
X _i = mean of Assay Method i with standard uncertainty u _{char i}	X _a = mean of Assay Method A with
w_i = the weighting factors for each method calculated using the inverse square of the variance: $w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$	u _{char} a = the standard uncertainty of characterization Method A
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{1/2}	CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² char a + u ² bb + u ² lts + u ² ts) ¹
k = coverage factor = 2	k = coverage factor = 2
$\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}$ are the errors from each characterization method	u _{char a} = the errors from characterization
ubb = bottle to bottle homogeneity standard uncertainty	u _{bb} = bottle to bottle homogeneity standard uncertainty
u _{lts} = long term stability standard uncertainty (storage)	ults = long term stability standard uncertainty (storage)
u _{te} = transport stability standard uncertainty	ute = transport stability standard uncertainty

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

4.0

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between $4^{\circ} - 24^{\circ}$ C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 13, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- January 13, 2027

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

SD978Ci Paul R Saines

Certificate of Analysis

Refine your results. Redefine your industry. RD:05/14/2024

INORGANIC" V E N T U R E S

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution
Catalog Number:	WW-LFS-1
Lot Number:	T2-MEB723367
Matrix:	5% (v/v) HNO3

	Value / Analyte(s):	1 000 µg/mL ea: Potassium,		
		600 μg/mL ea: Phosphorus,		
		300 µg/mL ea: Sodium,	Iron,	
		200 µg/mŁ ea: Magnesium, Cerium, Thallium,	Aluminum, Selenium,	
		100 µg/mL ea: Lead,	Calcium,	
		80 μg/mL ea: Arsenic,		
		70 μg/mL ea: Mercury,		
		50 μg/mL ea: Nickel,		
		40 µg/mL ea: Chromium,		
		30 µg/mL ea: Copper, Vanadium,	Boron,	
		20 μg/mL ea: Zinc, Barium, Cadmium, Manganese,	Strontium, Beryllium, Cobalt, Lithium,	
3.0	CERTIFIED VALUES	7.5 µg/mL ea: Silver AND UNCERTAINTI	ES	

ANALYTE Aluminum, Al	CERTIFIED VALUE 200.0 ± 0.7 µg/mL	ANALYTE Arsenic, As	CERTIFIED VALUE 80.0 ± 0.7 µg/mL
Barium, Ba	20.00 ± 0.09 µg/mL	Beryllium, Be	20.00 ± 0.13 µg/mL
Boron, B	30.00 ± 0.18 µg/mL	Cadmium, Cd	20.00 ± 0.09 µg/mL
Calcium, Ca	100.0 ± 0.4 μg/mL	Cerium, Ce	200.0 ± 0.8 μg/mL
Chromium, Cr	40.00 ± 0.30 μg/mL	Cobalt, Co	20.00 ± 0.10 µg/mL
Copper, Cu	30.00 ± 0.13 µg/mL	Iron, Fe	300.0 ± 1.3 μg/mL
Lead, Pb	100.0 ± 0.4 µg/mL	Lithium, Li	20.00 ± 0.08 µg/mL
Magneslum, Mg	200.0 ± 0.8 µg/mL	Manganese, Mn	20.00 ± 0.08 µg/mL
Mercury, Hg	70.0 ± 0.3 µg/mL	Nickel, Ni	50.00 ± 0.22 μg/mL
Phosphorus, P	600.0 ± 2.7 μg/mL	Potassium, K	1 000 ± 4 µg/mL
Selenium, Se	200.0 ± 1.3 µg/mL	Silver, Ag	7.50 ± 0.03 μg/mL
Sodium, Na	300.0 ± 1.4 μg/mL	Strontium, Sr	20.01 ± 0.08 µg/mL
Thailium, Ti	200.0 ± 1.4 µg/mL	Vanadium, V	30.00 ± 0.13 μg/mL
Zinc, Zn	20.00 ± 0.09 µg/mL		

Density:

1.034 g/mL (measured at 20 \pm 4 °C)

Assay Information:

ANALYTE Ag	METHOD ICP Assay	NIST SRM# 3151	SRM LOT# 160729
Ag	Volhard	999c	999c
Ag	Calculated		See Sec. 4.2
A	ICP Assay	3101a	140903
Al	EDTA	928	928
As	ICP Assay	3103a	100818
В	ICP Assay	3107	190605
Ba	ICP Assay	3104a	140909
Ва	Gravimetric		See Sec. 4.2
Be	ICP Assay	3105a	090514
Са	ICP Assay	3109a	130213
Ca	EDTA	928	928
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Се	ICP Assay	3110	090504
Ce	EDTA	928	928
Co	ICP Assay	3113	190630
Со	EDTA	928	928
Cr	ICP Assay	3112a	170630
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
Hg	ICP Assay	3133	160921
Hg	EDTA	928	928
к	ICP Assay	3141a	140813
к	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Li	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	ICP Assay	Traceable to 3152A	S2-NA700842
Na	Gravimetric	0400	See Sec. 4.2
Ni Ni	ICP Assay	3136	120619
P	EDTA	928 3139a	928
P	ICP Assay Acidimetric		060717
F Pb	ICP Assay	84L 3128	84L
Pb	EDTA	928	101026 928
Se	ICP Assay	3149	920 100901
Sr	EDTA	928	928
Sr	ICP Assay	Traceable to 3153a	920 K2-SR650985
TI	ICP Assay	3158	151215
V	IC Assay	3165	160906
v	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928
	Eco 4		

Page 4 of 6

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods	Characterization of CRM/RM by One Method
Certified Value, X _{CRMRM} , where two or more methods of characterization are used is the weighted mean of the results:	Certified Value, X _{CRM/RM} , where one method of characterization is used is the mean of individual results:
$\begin{split} & X_{CRM/RM} \equiv \Sigma(w_i) \; (X_i) \\ & X_i = \text{mean of Assay Method i with standard uncertainty } u_{char, i} \\ & w_i = \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ & w_i = (1/u_{char, i})^2 / (\Sigma(1/(u_{char, i})^2)) \end{split}$	$X_{CRM/RM} = (X_a) (u_{char a})$ $X_a = mean of Assay Method A withu_{char a} = the standard uncertainty of characterization Method A$
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k $(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{V_2}$ k = coverage factor = 2 $u_{char} = [\Sigma[(w_i)^2 (u_{char}_i)^2])^{V_2}$ where u_{char} is the errors from each characterization method u_{bb} = bottle to bottle homogeneity standard uncertainty $u_{lts} = long term stability standard uncertainty (storage) u_{te} = transport stability standard uncertainty$	CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k ($u^2_{chara} + u^2_{bb} + u^2_{tts} + u^2_{ts}$) ^{1/k} k = coverage factor = 2 u _{chara} = the errors from characterization u _{bb} = bottle to bottle homogeneity standard uncertainty u _{Its} = long term stability standard uncertainty (storage) u _{uts} = transport stability standard uncertainty

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

6.0 INTENDED USE

4.0

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Low Silver Note: This solution contains "LOW" levels of Silver. Please store this entire bottle inside a sealed glass jar.

8.0 **HAZARDOUS INFORMATION**

Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 **QUALITY STANDARD DOCUMENTATION**

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 30, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- August 30, 2026

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

SD9781.

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Page 6 of 6

Certificate of Analysis

Refine your results. Redefine your industry. RD:05/14/2024

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

ÍNORGANÍ

VENTURES

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution
Catalog Number:	WW-LFS-2
Lot Number:	U2-MEB731108
Matrix:	5% (v/v) HNO3 tr. HF
Value / Analyte(s):	200 μg/mL ea: Silica,
	80 μg/mL ea: Antimony,
	70 μg/mL ea: Tin,
	40 μg/mL ea: Molybdenum,
	20 μg/mL ea:
	Titanium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Antimony, Sb	CERTIFIED VALUE 80.1 ± 0.6 µg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 40.03 ± 0.18 µg/mL
Silica, SIO2	200.2 ± 1.3 μg/mL	Tin, Sn	70.0 ± 0.4 µg/mL
Titanium, Ti	20.01 ± 0.13 μg/mL		

Density:

1.025 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE Mo	METHOD ICP Assay	NIST SRM# 3134	SRM LOT# 130418
Мо	Calculated		See Sec. 4.2
Sb	ICP Assay	3102a	140911
SiO2	ICP Assay	3150	130912
Sn	ICP Assay	3161a	140917
π	ICP Assay	3162a	130925
ті	Calculated		See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, X_{CRWRM}, where two or more methods of characterization are used is the weighted mean of the results:

 $X_{CRM/RM} = \Sigma(w_i) (X_i)$

 X_i = mean of Assay Method i with standard uncertainty u_{char} i w_i = the weighting factors for each method calculated using the inverse square of the variance:

 $w_i = (1/u_{char_i})^2 / (\Sigma(1/(u_{char_i})^2))$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} \simeq k \left\{ u_{char}^2 + u_{bb}^2 + u_{ts}^2 + u_{ts}^2 \right\}^{\frac{1}{2}}$

k = coverage factor = 2

 $\begin{array}{l} u_{char} = [\overline{\Sigma}((w_{i})^{2} \, (u_{char})^{2})]^{2} \ \ \, \mbox{ where } u_{char} \ \, _{i} \mbox{ are the errors from each characterization method} \\ u_{bb} = bottle \ \, \mbox{ bottle homogeneity standard uncertainty} \\ u_{hs} = long \ \, \mbox{ term stability standard uncertainty (storage)} \end{array}$

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method Certified Value, X_{CRM/RM}, where one method of characterization is used is the mean of individual results:

$$\begin{split} X_{CRM/RM} = (X_{a}) (u_{oher \ a}) \\ X_{a} = mean \ of Assay Method A with \\ u_{oher \ a} = the standard uncertainty of characterization Method A \end{split}$$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{its}^2 + u_{ts}^2)^{1/2}$

 $\label{eq:coverage factor = 2} \\ u_{char} a = the errors from characterization \\ u_{bb} = bottle to bottle homogeneity standard uncertainty$ $u_{its} = long term stability standard uncertainty (storage)$ $u_{its} = transport stability standard uncertainty$

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

6.0 INTENDED USE

6.1 This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures <u>Terms and Conditions of Sale</u>. <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; Inorganicventures.com; Info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 17, 2023

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- March 17, 2028

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

NAMES AND SIGNATURES OF CERTIFYING OFFICERS 12.0

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

3D978

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

M4371

Hydroxylamine Hydrochloride, Crystal BAKER ANALYZED® A.C.S. Reagent Suitable for Mercury Determination (hydroxylammonium chloride)

Rec - 06.07.12



avantor

Material No.: 2196-01 Batch No.: 0000215387 Manufactured Date: 2018/06/27 Retest Date: 2025/06/25 Revision No: 1

Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

Test	Specification	Result
ssay (NH₂OH · HCl) (by KMnO₄ titrn)	>= 96.0 %	99.1
larity of Alcohol Solution	Passes Test	PT
esidue after Ignition	<= 0.050 %	0.017
itrable Free Acid (meq/g)	<= 0.25	0.19
mmonium (NH4)	Passes Test	РТ
ulfur Compounds (as SO4)	<= 0.005 %	< 0.003
race Impurities – ACS – Heavy Metals (as Pb)	<= 5 ppm	4
race Impurities – Iron (Fe)	<= 5 ppm	< 3
race Impurities – Mercury (Hg)	<= 0.050 ppm	< 0.005

For Laboratory, Research or Manufacturing Use

Country of Origin: CN Packaging Site: Paris Mfg Ctr & DC



Phillipsburg, NJ 9001:2015, FSSC22000 Paris, KY 9001:2008 Mexico City, Mexico 9001:2008 Gliwice, Poland 9001:2015, 13485:2012 Selangor, Malaysia 9001:2008 Dehradun, India, 9001:2008, 14001:2004, 13485:2003 Mumbai, India, 9001:2015, 17025:2005 Panoli, India 9001:2015

James Techie

Jamie Ethier Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone: 610.386.1700





Manufacturer: Saint-Gobain Performance Plastics 11 Sicho Drive Poestenkill, NY 12140

Certificate of Conformance

Part Number/ Revision:	D1069103 0	Customer Part Number/ Revision:	1069103 N/A
Description: *	PTFE BOILING STONES-450 GRA	AMS	
Lot Number:	26275770	Lot Quantity:	10 EA
Date of Manufacture (MM/DD/YY)	03/23/20	Expiration Date: (MM/DD/YY)	N/A
(Refer to the	Post Processing Run Number: attached Certificate for Additional Detail)		N/A

We certify the material listed above confirms in full with the following specifications:

All items have been manufactured, inspected, tested, and accepted in accordance with our Quality Management system, ISO 9001-2015. Documentation substantiating this certification is kept on record per the Company's retention policy and is available for review.

All materials and processes used in manufacturing conform to the materials and/or manufacturing specifications and notes indicated on the purchase order, drawing, specifications, quality assurance requirements, or other applicable documents effective on the date of manufacture.

Saint-Gobain does not warrant the product for any particular application and it is the responsibility of the user to conduct tests that are deemed necessary to determine the suitability of the product for any particular use. Saint-Gobain's sole responsibility shall be for failure to manufacture the product in accordance with specifications and requirements of the buyer, and from defects in material and workmanship. This warranty is expressly made in lieu of any and all other warranties and Saint-Gobain's sole liability shall be to replace any product not in conformance with the specification and requirements of the buyer.

	31			
Quality Approval:	Jorathan Kondlan	Date:	05/13/20	
		and the second secon		

Certificate of Analysis **ThermoFisher** S C I E N T I F I C

M4913-16

Page 1 of 1

Certificate of Analysis

1 Reagent Lane Fair Lawn, NJ 07410 201.796.7100 tel 201.796.1329 fax Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2015 by SAI Global Certificate Number CERT – 0120632

This is to certify that units of the lot number below were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Thermo Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Products are for research use or further manufacturing. Not for direct administration to humans or animals. It is the responsibility of the final formulator and end user to determine suitability based upon the intended use of the end product. Products are tested to meet the analytical requirements of the noted grade. The following information is the actual analytical results obtained.

Catalog Number	P279	Quality Test / Release Date	01/12/2021
Lot Number	210306		
Description	POTASSIUM PERMANGANATE, A.C.S.	· · · · · · · · · · · · · · · · · · ·	
Country of Origin	United States	Suggested Retest Date	Jan/2026

N/A			
Result Name	Units	Specifications	Test Value
APPEARANCE		REPORT	Dark purple to purple green crystals
ASSAY	%	>= 99	99.3
CHLORIDE & CHLORATE	%	<= 0.005	<0.005
IDENTIFICATION	PASS/FAIL	= PASS TEST	pass test
INSOLUBLE MATTER	%	<= 0.2	<0.2
MERCURY (Hg)	ppm	<= 0.05	<0.004
SULFATE (SO4)	%	<= 0.02	<0.02

Julian Buston

Julian Burton - Quality Control Manager - Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call at (800) 227-6701. *Based on suggested storage condition.

m/z->	N. 55 100	m/z-≻ 5.0E6	1.006	11/2-2 2.0E6	2.5E7	5.0E7	1. Indium Oxide (In)	Compound	Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	Expi	CERTIFIED WEIGHT REPORT: Part Lot	www.absolutestandards.com
210		110		10		[1] Spectrum No.1	IN086	RM#	Recommended Storage: Ambient (J Il Concentration (Jug/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Expiration Date:	<u>ORT:</u> Part Number: Lot Number:	п
220		120		NO		-	86 W1096A		Ambient (20 °C) 10000 6UTB uted to (mL): 50	100724	58149 100721 Indium (In)	
230		130		30		12.965 sec]	10000 99.999	Nominal Purity Conc. (µg/mL) (%)	0.06		-	NAGIO
240		140		4 0		12.965 sec]:57049.D# [Count] [Linear]	0.10	Uncertainty Purity (%)	5E-05 Balance Uncertainty 0.058 Flask Uncertainty		Solvent:	R: 10/08
250		150		50		[Count] [Lin	82.6 6.05408	Assay Target (%) Weight (g)	inty Y	5% 25.0 (mL)	Lot # ent: 20370011	121
260		160		0		ear]	6.05441	Actual Weight (g)		Nitric Acid	Nitric Acid	Ð
		170		70			10000.6 2	Exp Actual Unce Conc. (µg/mL) +/- (Revi	Form	re	
		180		80			20.1 1312-43-2	Expanded Uncertainty (Sol +/- (µg/mL) CAS#	Reviewed By:	Formulated By:	fioranci	
		190		00			NA	SDS Informa olvent Safety Info. On OSHA PEL (TWA)	Pedro L. Rentas	Giovanni Esposito	Cape	
		200		100			NA	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50			A	https://Absolutestandards.com
	n an						3124a	NIST	100721	100721		tandards.co

1 of 2

Part # 58149

Lot # 100721

Printed: 10/7/2021, 2:18:03 PM

www.absolutestandards.com	800-368-1131	Absolute Standards,
		Inc.



Certified Reference Material CRM



https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

							Trace Me	etals	Verificat	ion b	y ICP-MS	(hð	/mL)	-					
2	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	5	<0.02	N.	<0.02	- PA	<0.02	Se	<0.2	1 11 1	40.02	W	40.02
Sb	<0.02	Ca	<0.2	Ę	<0.02	Но	<0.02	L	<0.02	Nb	<0.02	Re	<0.02	S	<0.02	Te	<0.02	с	<0.02
As	<0.2	Ce	<0.02	E	<0.02	In	Т	Mg	<0.01	õ	<0.02	Rh	<0.02	Ag	<0.02	Н	<0.02	<	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ŀ	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	40.2	Th	<0.02	Υb	<0,02
Be	<0.01	ç	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	C ₀	<0.02	ଜୁ	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	2	<0.02
в	<0.02	Cu	<0.02	Au	<0.02	РЬ	<0.02	Nd	<0.02	~	<02	Sc	<0.02	Ta	<0.02	Н	<0.02	Z	<0.02

(I)= larget analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

the 1. - S

Certified by:

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com M5062 M5063

P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Mass Spec Solution
Catalog Number:	MSHG-10PPM
Lot Number:	S2-HG709270
Matrix:	10% (v/v) HCI
Value / Analyte(s):	10 µg/mL ea: Mercury
Starting Material:	Hg metal
Starting Material Lot#:	1959
Starting Material Purity:	99.9994%
CERTIFIED VALUES	AND UNCERTAINTIES

Certified Value:	10.001 ± 0.053 μg/mL
Density:	1.020 g/mL (measured at 20 \pm 4 °C)

Assay Information:

3.0

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Hg	ICP Assay	3133	160921
Hg	EDTA	928	928
Hg	Calculated		See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods	Characterization of CRM/RM by One Method
Certified Value, X _{CRM/RM} , where two or more methods of characterization are used is the weighted mean of the results:	Certified Value, X _{CRWRM} , where one method of characterization is used is the mean of individual results:
$X_{CRM/RM} = \Sigma(w_i) (X_i)$	$X_{CRM/RM} = (X_a) (u_{char a})$
X _i = mean of Assay Method i with standard uncertainty u _{char i}	X _a = mean of Assay Method A with
w_i = the weighting factors for each method calculated using the inverse square of the variance. $w_i = (1/u_{char} i)^2 / (\Sigma(1/(u_{char} i)^2))$	uchar a = the standard uncertainty of characterization Method A
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{1/2}	CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k $(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{\frac{1}{2}}$
k = coverage factor = 2	k = coverage factor = 2
$u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{\frac{1}{2}}$ where u_{char} are the errors from each characterization method	uchar a = the errors from characterization
ubb = bottle to bottle homogeneity standard uncertainty	ubb = bottle to bottle homogeneity standard uncertainty
u _{lts} = long term stability standard uncertainty (storage)	ults = long term stability standard uncertainty (storage)
uts = transport stability standard uncertainty	uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

0	Ag		0.000011	M	Eu	<	0.000201	0	Na		0.000004	М	Se	<	0.015915	0	Zn	<	0.001510
0	AI		0.000001	0	Fe		0.000001	Μ	Nb	<	0.000201	0	Si		0.000005	М	Zr	<	0.000201
Μ	As	<	0.000402	Μ	Ga	<	0.000201	Μ	Nd	<	0.000201	М	Sm	<	0.000201				
М	Au	<	0.003631	М	Gd	<	0.000201	M	Ni	<	0.000402	M	Sn	<	0.001007				
Μ	В	<	0.001208	Μ	Ge	<	0.000201	М	Os	<	0.000605	М	Sr	<	0.000201				
Μ	Ba	<	0.000201	Μ	Hf	<	0.000201	0	Ρ	<	0.032370	Μ	Та	<	0.000201				
Μ	Be	<	0.000201	s	Hg	<		Μ	Pb	<	0.000201	M	Tb	<	0.000201				
Μ	Bi	<	0.000201	М	Ho	<	0.000201	Μ	Pd	<	0.000403	М	Te	<	0.002216				
0	Ca		0.000007	Μ	In	<	0.000201	Μ	Pr	<	0.000201	М	Th	<	0.000201				
M	Cd	<	0.000201	М	Ir	<	0.000201	Μ	Pt	<	0.000402	M	Ti	<	0.000402				
Μ	Ce	<	0.000201	0	Κ		0.000020	М	Rb	<	0.000201	0	ΤI	<	0.016508				
M	Co	<	0.000201	М	La	<	0.000201	Μ	Re	<	0.000201	Μ	Tm	<	0.000201				
0	Cr	<	0.003021	0	Li	<	0.000107	М	Rh	<	0.000201	М	U	<	0.008058				
М	Cs	<	0.001208	М	Lu	<	0.000201	Μ	Ru	<	0.000201	Μ	V	<	0.000201				
М	Cu	<	0.000402	0	Mg		0.000001	0	S	<	0.053950	М	W	<	0.000604				
M	Dy	<	0.000201	M	Mn	<	0.000604	М	Sb	<	0.001208	М	Y	<	0.000201				
Μ	Er	<	0.000201	М	Мо		0.000009	М	Sc	<	0.000201	М	Yb	<	0.000201				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between $4^{\circ} - 24^{\circ}$ C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 200.59 +2 4 Hg(OH)(aq) 1+ Chemical Compatibility - Stable in HNO3. Avoid basic media forming insoluble carbonate. The sulfide, basic carbonate, oxalate, phosphate, arsenite, arsenate and iodide are insoluble in water.

Stability - 2-100 ppb levels not stable in 1% HNO3 / LDPE container, stable in 10% HNO3 packaged in borosilicate glass. 1-100 ppm levels stable in 7% HNO3 packaged in borosilicate glass. 1000-10,000 ppm solutions are chemically stable for years in 5-10% HNO3 / LDPE container.

Hg Containing Samples (Preparation and Solution) - Metal (soluble in HNO3); Oxide (Soluble in HNO3); Ores and Organic based (The literature has more references to the preparation of Hg containing samples than any other element. Please consult the literature for your specific sample type, since such preparations are prone to error. Or e-mail our technical staff and we will contact you to discuss your particular sample preparation guestions in further detail.).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe
ICP-MS 202 amu	9 ppt	n/a	186W16O
ICP-OES 184.950 nm	0.03 / 0.005 µg/mL	1	
ICP-OES 194.227 nm	0.03 / 0.005 µg/mL	1	V
ICP-OES 253.652 nm	0.1 / 0.03 µg/mL	1	Ta, Co, Th ,Rh , Fe,
			U

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 22, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- September 22, 2026

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS Certificate Prepared By:

Uyen Truong Supervisor, Product Documentation

Ulya new

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Laine



QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program"

Instructions for QATS Reference Material: ICP-AES ICS

QATS LABORATORY INORGANIC REFERENCE MATERIAL INTERFERENCE CHECK SAMPLE SET FOR ICP-AES (ICSA WITH ICSB)

NOTE: These instructions are for advisory purposes only. If any apparent conflict exists between these instructions and the analytical protocol or your contract, disregard these instructions.

- **APPLICATION:** For use with the CLP SFAM01.0 SOW and revisions.
 - **<u>CAUTION</u>**: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more bottles of Aqueous Reference Material, each composed of metals at various concentrations and prepared with nitrate salts and oxy-acids of the respective elements in a 5% nitric acid matrix. For the reference material source in reporting ICSA and ICSAB mixture use "USEPA". For the reference material lot number for the ICSA use "ICSA-1211" and for the ICSAB mixture use "ICSA-1211+ICSB-0710".

<u>CAUTION:</u> The bottle(s) should be protected from light during storage to ensure the stability of silver which is contained in the ICSB solution. The bottle(s) should be stored at room temperature. **Do not allow the solution(s) to freeze.**

(B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided below.

QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY APTIM Federal Services, LLC 2700 Chandler Avenue - Building C Las Vegas, NV 89120

(C) ANALYSIS OF SAMPLES

The interference check sample set is to be used to verify inter-element and background correction factors of inductively-coupled plasma (ICP) spectrometers. This reference material set consists of two (2) concentrated solutions. The ICSA solution contains the four (4) interferent elements: AI, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,

RM ICP-AES ICSA-1211 B-0710 SFAM.docx

Page 1 of 2

QATS Form 20-007F189R01, 01-17-2023



The Quality Assurance Technical Support (QATS) contract is operated by APTIM Federal Services, LLC.



ICSA

M5126

M5127

M5128

M5129

M5130

Instructions for QATS Reference Material: ICP-AES ICS

Cd, Co, Cr, Cu, Mn, Ni, Pb, Tl, Se, V, and Zn. This instruction sheet provides the nominal values for ICP-AES Part A and Part B target analytes when diluted as directed.

Using Class "A" glassware, preparation and analysis must be performed according to the following instructions:

ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSA solution by ICP-AES.

ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSAB solution by ICP-AES.

(D) "CERTIFIED VALUE" CONCENTRATIONS OF QATS ICP-AES ICS SOLUTION(S)

The "Certified Value" concentrations of the elements, listed in Table 1 below, were derived from statistically pooled analysis results from the following sources, if available: QATS Laboratory, CLP laboratories, Quarterly Blind (QB)/Proficiency Testing (PT) events, CLP pre-award events, and external referee laboratories.

Table 1.	"CERTIFIE			ERENCE CH	IECK SAMPL CSB-0710	E ICP-AES IO	CSA-1211,
Element	CRQL	Part A (µg/L)	Low Limit (µg/L)	High Limit (µg/L)	Part A +Part B (µg/L)	Low Limit (µg/L)	High Limit (µg/L)
AI	200	255000	216000	294000	247000	209000	285000
Sb	60	(0.0)	-60.0	60.0	618	525	711
As	10	(0.0)	-10.0	10.0	104	88.4	120
Ва	200	(6.0)	-194	206	(537)	337	737
Be	5.0	(0.0)	-5.0	5.0	495	420	570
Cd	5.0	(1.0)	-4.0	6.0	972	826	1120
Са	5000	245000	208000	282000	235000	199000	271000
Cr	10	(52.0)	42.0	62.0	542	460	624
Со	50	(0.0)	-50.0	50.0	476	404	548
Cu	25	(2.0)	-23.0	27.0	511	434	588
Fe	100	101000	85600	116500	99300	84400	114500
Pb	10	(0.0)	-10.0	10.0	(49.0)	39.0	59.0
Mg	5000	255000	216000	294000	248000	210000	286000
Mn	15	(7.0)	-8.0	22.0	507	430	584
Ni	40	(2.0)	-38.0	42.0	954	810	1100
Se	35	(0.0)	-35.0	35.0	(46.0)	11.0	81.0
Ag	10	(0.0)	-10.0	10.0	201	170	232
TI	25	(0.0)	-25.0	25.0	(108)	83.0	133
V	50	(0.0)	-50.0	50.0	491	417	565
Zn	60	(0.0)	-60.0	60.0	952	809	1095

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value \pm 1 times the associated CLP SOW CRQL. The acceptance ranges for all other analytes were determined using the certified value \pm 15 percent of the listed certified value.

m/z->	1.0E6	2.0E6	m/z->	1000	2000	1.0E5	2.0E5	1. Ammonium molybdate (Mo)	Compound	Volume show	NIST Tes	Recommended Storage: Nominal Concentration (µg/mL):	Expire	Part Lot Des	CERTIFIED WEIGHT REPORT:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
210			110		đ		[1] Spectrum No.1		Nur	vn below was o	NIST Test Number:	d Storage: n (µg/mL):	Expiration Date:	Part Number: Lot Number: Description:		s, Inc.
2			120		N		No.1	58142 022222	Part Lot Number Number	Volume shown below was diluted to (mL):	6UTB	Ambient (20 °C) 1000	051725	57042 051722 Molybde		-
							[8.594	0.1000	Dilution Factor	3000.41		20 °C)		<u>57042</u> <u>051722</u> Molybdenum (Mo)		
			130		G		sec]:5704	300.0	Initial Un Vol. (mL) Pip	0.058 Flas	5E-05 Bala					M.S.
			140		40 0		8.594 sec]:57042.D# [Count] [Linear]	0.084	Uncertainty N Pipette (mL) Conc	Flask Uncertainty	Balance Uncertainty			MKE	_	Certified Rep M.5192
			150		50		unt] [Líne	1000	Nominal Conc. (µg/mL) Co				0.5%	MKBQ8597V Am	Lot #	ference M.
			160		60)ar]	10001.0	Initial Conc. (µg/mL) C				15.0 ×	Ammonium hydroxide		Certified Reference Material CRM いちいのえいたいのんりはてい
			170		70			1000.0	Final Conc. (µg/mL)	Г			Ammonium hydroxide	æ	-	M 172
								2.1	Expanded Uncertainty +/- (µg/mL)		Reviewed By:	N's	Formulated By:	A		
			180		80			13106-76-8	(Solve CAS#			to I		deronce		•
			190		90			5 mg(Mo)/m3	SDS Information nt Safety Info. On Attac OSHA PEL (TWA)		Pedro L. Rentas	era	Lawrence Barry	An		nt 、
			200		100			13 orl-rat 333 mg/kg	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50		s 051722	/	rry 051722	Ψ		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
								kg 3134	NIST		722		722			4 Accredite ate Numbe ndards.com

Part # 57042 Lot # 051722

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	Inc



Certified Reference Material CRM



https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

							Trace M	letals	Verifica	ition	by ICP-N	IS (µ	g/mL)						
A	<0.02	ß	40.02	Dv	20.02	Ηŕ	3	1	-	1									
SP SP	A).02	Ĵ,	2.5	7 5	10.02	1	<0.02	' E	20.02	N	<0.02	P	<0.02	Se	<0.2	4L	<0.02	W	<0.02
<u>,</u>		<u>م</u>	10.2	5	20.02	Ho	<0.02	Lu	<0.02	ß	<0.02	Re	<0.02	Si	40.02	5	<0.02	11	4000
2	202	ŝ	20.02	E	<0.02	h	<0.02	Mg	<0.01	ò	<007	Rh	50	۸,	2003	3	3	: (
Ba	40.02	S	<0.02	2	300	7	3	ξ,	2	2			10.02	26	70.02		20.02	<	20.02
Be	5	?	3	2	20.02	l =	70.02	UTAT	20.02	Pd	<0.02	Rb	<0.02	Na	40.2	Ъ	<0.02	ΥЪ	<0.02
	-	2	70.02	Ca	<0.02	He	<02	Hg	40.2	P	<0.02	Ru	<0.02	S	40.02	J	300	<	2003
Id	20.02	6	40.02	ଜ	<0.02	5	40.02	Mo	÷	¥	2003	ŝ	202	0	5	>		1,	10104
ω	40.02	6	<0.02	An	3	ş	3	E		; ;	TO'NE	UH	70.02	0	20.05	Sn	20.02	5	<0.02
					10.01	0.1	20.05	ING	20.02	~	40.2	Sc	<0.02	Ta	<0.02	Т	<0.02	72	<0.02
																			And in the second secon

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Son 1. S

Certified by:

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 57042 Lot # 051722



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

130925

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Ti

Product Code:	Multi Analyte Custom Grade Solution	on
Catalog Number:	CHEM-QC-4	
Lot Number:	S2-MEB711674	
Matrix:	3% (v/v) HNO3 3% (v/v) HF	
Value / Analyte(s):	1 000 μg/mL ea: Boron, Silicon, Titanium	Molybdenum, Tin,

Second Source: Whenever possible, this solution was manufactured from a second set of concentrates in our manufacturing facility.

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ICP Assay

ANALYTE Boron, B	CERTIFIED VALUE 1 000 ± 7 μg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 1 000 ± 5 μg/mL	
Silicon, Si	1 000 ± 7 μg/mL	Tin, Sn	1 000 ± 5 μg/mL	
Titanium, Ti	1 001 ± 6 μg/mL			
Density:	1.032 g/mL (meas	sured at 20 ± 4 °C)		
Assay Information	ו:			
ANALYTE	METHOD	NIST SRM#		SRM LOT#
В	ICP Assay	3107		110830
Мо	ICP Assay	3134		130418
Si	ICP Assay	3150		130912
Sn	ICP Assay	3161a		140917

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

3162a

Characterization of CRM/RM by Two or More Methods Certified Value, X _{CRM/RM} , where two or more methods of characterization are	Characterization of CRM/RM by One Method Certified Value, X _{CRM/RM} , where one method of characterization
used is the weighted mean of the results:	is used is the mean of individual results:
$X_{CRM/RM} = \Sigma(w_i) (X_i)$	X _{CRM/RM} = (X _a) (u _{char a})
X _i = mean of Assay Method i with standard uncertainty u _{char i}	X _a = mean of Assay Method A with
w_i = the weighting factors for each method calculated using the inverse square of the variance: $w_i = (1/u_{char})^2 / (\Sigma(1/(u_{char})^2))$	u _{char a} = the standard uncertainty of characterization Method A
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{1/2}	CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² char a + u ² bb + u ² lts + u ² ts) ¹
k = coverage factor = 2	k = coverage factor = 2
$u_{char} = \left[\sum \left((w_i)^2 (u_{char})^2 \right) \right]^{\frac{1}{2}}$ where u_{char} are the errors from each characterization method	uchar a = the errors from characterization
ubb = bottle to bottle homogeneity standard uncertainty	ubb = bottle to bottle homogeneity standard uncertainty
u _{lts} = long term stability standard uncertainty (storage)	ults = long term stability standard uncertainty (storage)
ute = transport stability standard uncertainty	ute = transport stability standard uncertainty

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

4.0

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between $4^{\circ} - 24^{\circ}$ C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- November 02, 2026

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line



QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program"

Instructions for QATS Reference Material: ICP-AES ICS

QATS LABORATORY INORGANIC REFERENCE MATERIAL INTERFERENCE CHECK SAMPLE SET FOR ICP-AES (ICSA WITH ICSB)

NOTE: These instructions are for advisory purposes only. If any apparent conflict exists between these instructions and the analytical protocol or your contract, disregard these instructions.

- **APPLICATION:** For use with the CLP SFAM01.0 SOW and revisions.
 - **<u>CAUTION</u>**: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more bottles of Aqueous Reference Material, each composed of metals at various concentrations and prepared with nitrate salts and oxy-acids of the respective elements in a 5% nitric acid matrix. For the reference material source in reporting ICSA and ICSAB mixture use "USEPA". For the reference material lot number for the ICSA use "ICSA-1211" and for the ICSAB mixture use "ICSA-1211+ICSB-0710".

<u>CAUTION:</u> The bottle(s) should be protected from light during storage to ensure the stability of silver which is contained in the ICSB solution. The bottle(s) should be stored at room temperature. **Do not allow the solution(s) to freeze.**

(B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided below.

QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY APTIM Federal Services, LLC 2700 Chandler Avenue - Building C Las Vegas, NV 89120

(C) ANALYSIS OF SAMPLES

The interference check sample set is to be used to verify inter-element and background correction factors of inductively-coupled plasma (ICP) spectrometers. This reference material set consists of two (2) concentrated solutions. The ICSA solution contains the four (4) interferent elements: AI, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,

RM ICP-AES ICSA-1211 B-0710 SFAM.docx

Page 1 of 2

QATS Form 20-007F189R01, 01-17-2023



The Quality Assurance Technical Support (QATS) contract is operated by APTIM Federal Services, LLC.



ICSA

M5126

M5127

M5128

M5129

M5130

Instructions for QATS Reference Material: ICP-AES ICS

Cd, Co, Cr, Cu, Mn, Ni, Pb, Tl, Se, V, and Zn. This instruction sheet provides the nominal values for ICP-AES Part A and Part B target analytes when diluted as directed.

Using Class "A" glassware, preparation and analysis must be performed according to the following instructions:

ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSA solution by ICP-AES.

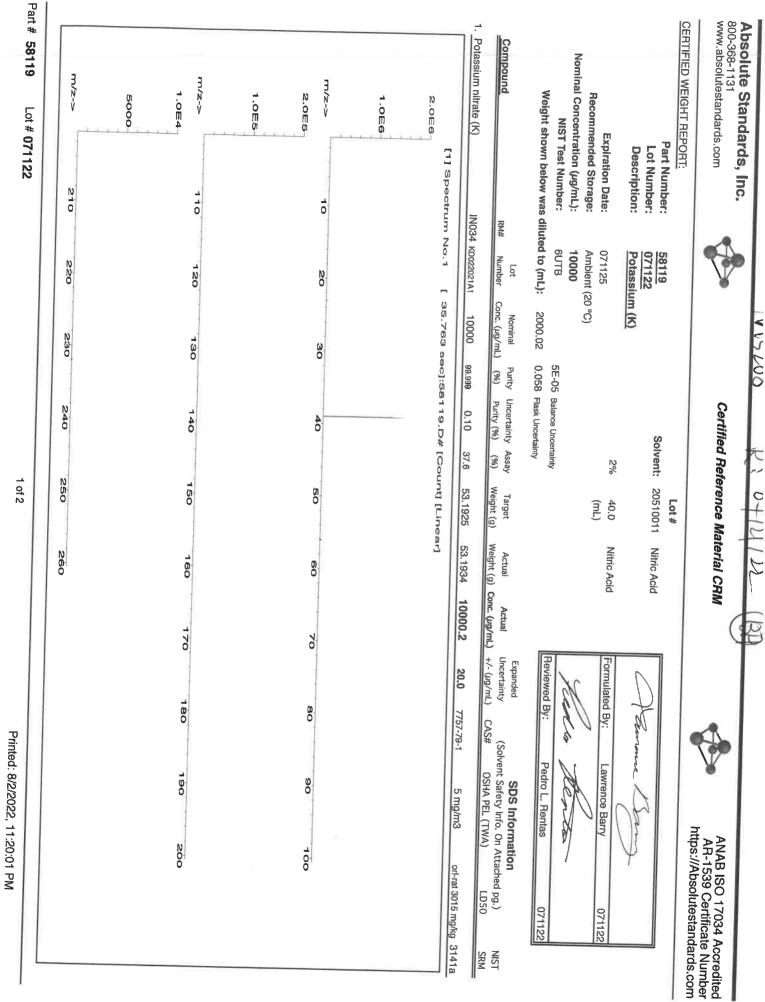
ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSAB solution by ICP-AES.

(D) "CERTIFIED VALUE" CONCENTRATIONS OF QATS ICP-AES ICS SOLUTION(S)

The "Certified Value" concentrations of the elements, listed in Table 1 below, were derived from statistically pooled analysis results from the following sources, if available: QATS Laboratory, CLP laboratories, Quarterly Blind (QB)/Proficiency Testing (PT) events, CLP pre-award events, and external referee laboratories.

Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-AES ICSA-1211, AND ICSA-1211 MIXED WITH ICSB-0710								
Element	CRQL	Part A (µg/L)	Low Limit (µg/L)	High Limit (µg/L)	Part A +Part B (µg/L)	Low Limit (µg/L)	High Limit (µg/L)	
AI	200	255000	216000	294000	247000	209000	285000	
Sb	60	(0.0)	-60.0	60.0	618	525	711	
As	10	(0.0)	-10.0	10.0	104	88.4	120	
Ва	200	(6.0)	-194	206	(537)	337	737	
Be	5.0	(0.0)	-5.0	5.0	495	420	570	
Cd	5.0	(1.0)	-4.0	6.0	972	826	1120	
Ca	5000	245000	208000	282000	235000	199000	271000	
Cr	10	(52.0)	42.0	62.0	542	460	624	
Со	50	(0.0)	-50.0	50.0	476	404	548	
Cu	25	(2.0)	-23.0	27.0	511	434	588	
Fe	100	101000	85600	116500	99300	84400	114500	
Pb	10	(0.0)	-10.0	10.0	(49.0)	39.0	59.0	
Mg	5000	255000	216000	294000	248000	210000	286000	
Mn	15	(7.0)	-8.0	22.0	507	430	584	
Ni	40	(2.0)	-38.0	42.0	954	810	1100	
Se	35	(0.0)	-35.0	35.0	(46.0)	11.0	81.0	
Ag	10	(0.0)	-10.0	10.0	201	170	232	
TÎ	25	(0.0)	-25.0	25.0	(108)	83.0	133	
V	50	(0.0)	-50.0	50.0	491	417	565	
Zn	60	(0.0)	-60.0	60.0	952	809	1095	

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value \pm 1 times the associated CLP SOW CRQL. The acceptance ranges for all other analytes were determined using the certified value \pm 15 percent of the listed certified value.



Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	Certified Reference Material CRM	*	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
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QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program" R : 以120 2 [

Instructions for QATS Reference Material: Inorganic ICV Solutions

QATS LABORATORY INORGANIC REFERENCE MATERIAL INITIAL CALIBRATION VERIFICATION SOLUTIONS (ICV1, ICV5, AND ICV6)

NOTE: These instructions are for advisory purposes only. If any apparent conflict exists between these instructions and the analytical protocol or your contract, disregard these instructions.

- APPLICATION: For use with the CLP SFAM01.0 SOW and revisions.
 - **<u>CAUTION</u>**: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Metals in Dilute Acidic or Cyanide in Basic Aqueous Solutions HAZARDOUS MATERIAL

> Safety Data Sheets Available Upon Request



(A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more Aqueous Inorganic Reference Materials containing various analyte concentrations. ICV1 and ICV5 are in a matrix of dilute nitric acid. ICV6 is in a matrix of dilute basic solution. For the reference material source in reporting ICVs use "USEPA". For the reference material lot number for the ICV1, ICV5, and ICV6 solutions use "ICV1-1014", "ICV5-0415", and "ICV6-0400", respectively.

(B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided below.

QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY APTIM Federal Services, LLC 2700 Chandler Avenue - Building C Las Vegas, NV 89120

(C) ANALYSIS OF SAMPLES

The Initial Calibration Verification Solutions (ICVs) are to be used to evaluate the accuracy of the initial calibrations of ICP, AA, and Cyanide colorimetric instruments, and are to be used with the CLP SOWs and revisions. The values for each element in the ICVs are listed below in $\mu g/L$ (ppb) for the resulting solution(s) after the dilution of the concentrate(s) according to the following instructions. Use Class 'A' glassware to prepare the solution(s).

ICV1-1014 For ICP-AES analysis, use a 10-fold dilution by pipetting 10 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid.

RMs ICV 1, 5, 6 SFAM.docx

Page 1 of 2

QATS Form 20-007F188R00, 04-19-2021



The Quality Assurance Technical Support (QATS) contract is operated by APTIM Federal Services, LLC.



QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program"

AP11MInstructions for QATS Reference Material: Inorganic ICV SolutionsICV1-1014For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate
into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.ICV5-0415For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting
1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume
with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K2Cr2O7
and 5% (v/v) nitric acid.ICV6-0400For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6
concentrate into a 100 mL volumetric flask and dilute to volume with Type II water.
Distill this solution along with the samples before analysis. The cyanide concentrate
is prepared from K3Fe(CN)6, Type II water, and 0.1 % sodium hydroxide, and will
decompose rapidly if exposed to light.

NOTE: USE TYPE II WATER AND HIGH-PURITY ACIDS FOR ALL DILUTIONS.

(D) CERTIFIED CONCENTRATIONS OF QATS ICV1, ICV5, AND ICV6 SOLUTIONS

	ICV1-1014	
Element	Concentration (µg/L) (after 10-fold dilution)	Concentration (µg/L) (after 50-fold dilution)
AI	2500	500
Sb	1000	200
As	1000	200
Ba	520	100
Be	510	100
Cd	510	100
Ca	10000	2000
Cr	520	100
Co	520	100
Cu	510	100
Fe	10000	2000
Pb	1000	200
Mg	6000	1200
Mn	520	100
Ni	530	110
K	9900	2000
Se	1000	200
Ag	250	50
Na	10000	2000
TI	1000	210
V	500	100
Zn	1000	200

	ICV5-0415		ICV6-0400
Element	Concentration (µg/L) (after 100-fold dilution)	Analyte	Concentration (µg/L) (after 100-fold dilution)
Hg	4.0	CN [.]	99

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ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

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Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

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- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
 - All standard containers are meticulously cleaned prior to use.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 - Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Lot Number: Description: Expiration Date: Thilum (070622 Recommended Storage: Nominal Concentration (µg/mL): Nominal Concentration (µg/mL): Neight shown below was diluted to (mL): Compound RM# Number	1. Lithium nitrate (Li) IN01	[1] Spectrum No.1 1.0E6 5.0E5 m/z-> 10 500 500 500 10 10 10 10 10 10 10 10 10	



ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

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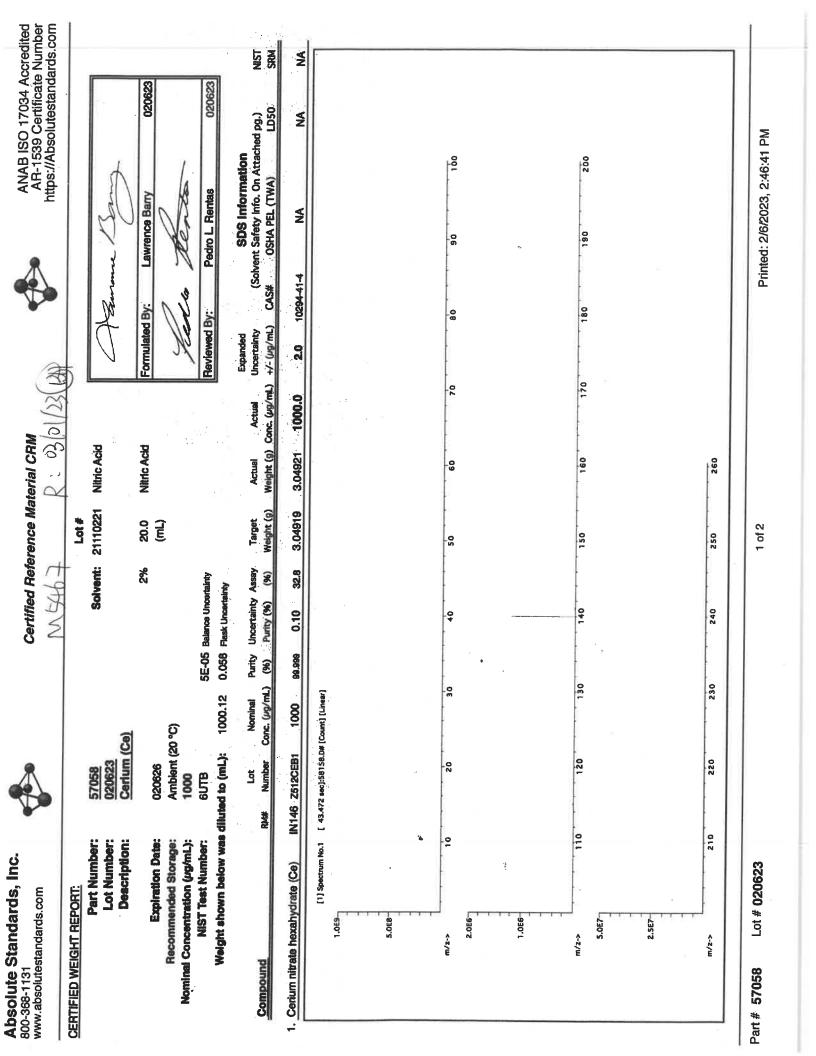
Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
 - All standard containers are meticulously cleaned prior to use.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). All Standards should be stored with caps tight and under appropriate laboratory conditions.

Lot # 070622 Part # 57103





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS);

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Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

Ser P

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

All standard containers are meticulously cleaned prior to use.

Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	031523	on ttached pg.) NIST LD50 SRM ont-rat >2000mo/kg 3109a	Ő	O O N
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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part Number: 58120 Lot Number: 031523 Description: 031526 Expiration Date: 031526 Recommended Storage: Ambient (2 Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Compound 1. Calcium carbonate (Ca)	2.0E4 1.0E4 3.0E4 5.0E4 2.5E4	T.OES 1.0ES 5.0E4 m/2-> 2 m/2-> 2 Part # 58120 Lot # 031523

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Absolute Standards, inc. 800-368-1131 www.absolutestandards.com

Certified Reference Material CRM



Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

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	≤0.02	გ	<u>60.02</u>	ප්	40.02	3	0.02	Mo	<0.02	æ	<0.02	Sn	<0.02	S	<0.02	Sn	<0.02	Ŋ	<0.02
	≤0.02	ð	<u>60.05</u>	Au	000	£	<0.02	PN	<u>40.02</u>	Å	40.2	ŝ	<0.02	T.	≤0.02	Ę	<0.02	2	2002

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.

* All Standards should be stored with caps tight and under appropriate laboratory conditions.

* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58120 Lot # 031523

Sodium Chloride, Crystal BAKER ANALYZED® A.C.S. Beagent M.S.M. and M.J.M. A.M. M.J.M. A.M. A.M. M. A.M. M.S.M. M.S.M. M.S.M. A.M. M.S.M. M.S.M. M.S.M. M.S.M. A.M. M.S.M. M.S.M. M.S.M. M.



Material No.: 3624-01 Batch No.: 0000281938 Manufactured Date: 2021-06-07 Retest Date: 2026-06-07 Revision No.: 2

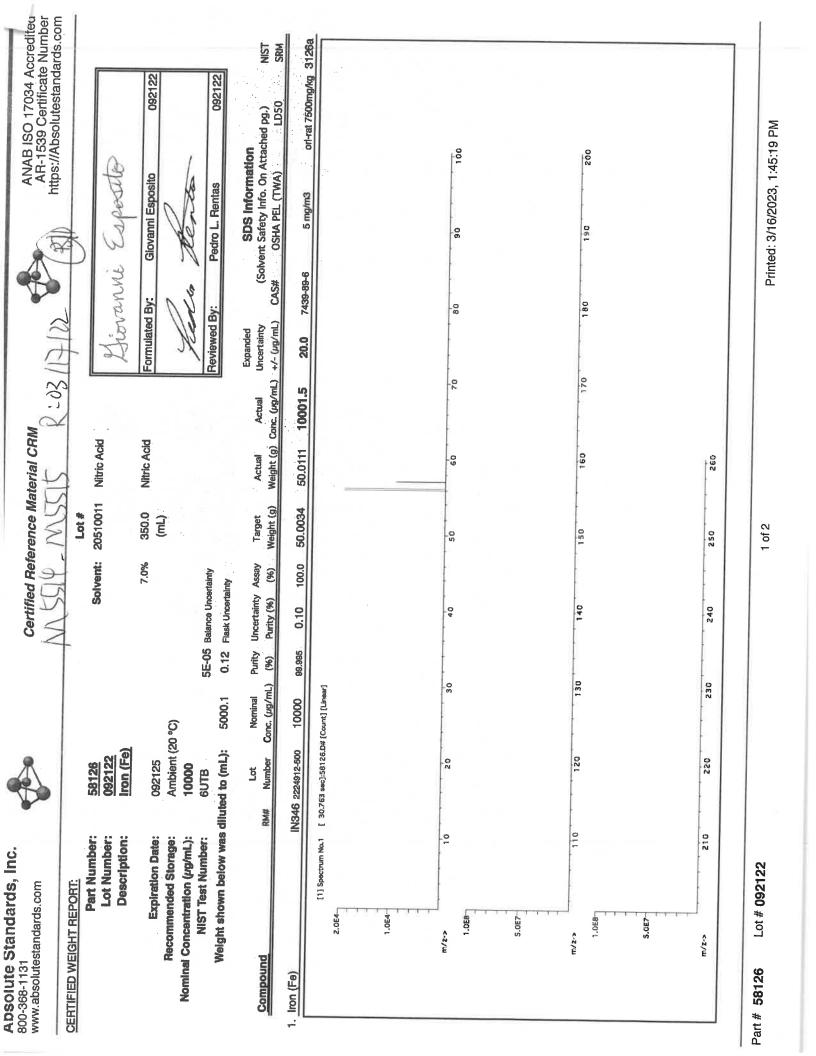
Certificate of Analysis

Test	Specification	Result
Assay (NaCl) (by Ag titrn)	≥ 99.0 %	100.0 %
pH of 5% Solution at 25°C	5.0 - 9.0	6.3
Insoluble Matter	≤ 0.005 %	0.003 %
lodide (I)	≤ 0.002 %	< 0.002 %
Bromide (Br)	≤ 0.01 %	< 0.01 %
Chlorate and Nitrate (as NO₃)	≤ 0.003 %	< 0.001 %
ACS - Phosphate (PO ₄)	≤ 5 ppm	< 5 ppm
Sulfate (SO₄)	≤ 0.004 %	< 0.004 %
Barium (Ba)	Passes Test	Passes Test
ACS - Heavy Metals (as Pb)	≤ 5 ppm	< 5 ppm
Iron (Fe)	≤ 2 ppm	< 1 ppm
Calcium (Ca)	≤ 0.002 %	< 0.001 %
Magnesium (Mg)	≤ 0.001 %	< 0.001 %
Potassium (K)	≤ 0.005 %	0.001 %

For Laboratory,Research,or Manufacturing Use Meets Reagent Specifications for testing USP/NF monographs Country of Origin: USA Packaging Site: Paris Mfg Ctr & DC



For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700



Certified Reference Material CRM



Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

E	<0.02	G	<0.02	Ŋ	<0.02	Hf	<0.02	п	<0.02	ÿ	<0.10	놊	<0.02	Se	40.2	4	<0.02	M	<0.02
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	<0.02	8	<0.10	Au	<0.02	£	<0.02	PN	20.02	M	402	3	40.02	f	<0.02	F	<0.02	77	<000×

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm delonized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

All standard containers are meticulously cleaned prior to use.

Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* All Standards should be stored with caps tight and under appropriate laboratory conditions.

* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Lot # 092122 Part # 58126



MATERIAL CERTIFICATE OF COMPLIANCE

DATE: JUNE 12, 2023

CUSTOMER:PCI SCIENTIFIC SUPPLY, INCPURCHASE ORDER NO.6054931CATALOG NO.BOI5021-450LPRODUCT DESCRIPTION:BOILING STONES, TFE, 454GMSQUANTITY:10 EACH

SPECIFICATION (S): Made from Virgin PTFE Resin

LOT NO.

We certify that we have complied with the terms and conditions of the above Purchase Order and the Part Specifications in the manufacturing of the above product.

W126678

Valu

Laura Valencia Quality Assurance Inspector

F:U:J:GF:PCISCI:COC-55118-BOI5021-061223

CORCO CHEMICAL CORPORATION

Manufacturers of ACS Reagents and Semiconductor Grade Chemicals

CERTIFICATE OF ANALYSIS

Date: 8/3/2022

M5631 M5632 M5633 M5634 Lot No 820803

Hydrogen Peroxide, ACS Reagent Grade

TEST	MAXIMUM LIMITS	RESULT
Appearance	Colorless and free from suspended matter or sediment	Pass
Assay	29-32%	31.4%
Color (APHA)	10	5
Residue after Evaporation	0.002%	.0001%
Titratable Acid	0.0006 meq/g	< .0006 meq/g
Chloride (Cl)	2 ppm	< 1 ppm
Nitrate (NO ₃)	2 ppm	< 1 ppm
Phosphate	2 ppm	< 1 ppm
Sulfate (SO ₄)	5 ppm	< .5 ppm
Ammonium (NH4)	5 ppm	< 1 ppm
Heavy Metals (as Pb)	1 ppm	< .1 ppm
lron (Fe)	0.5 ppm	< .1 ppm
Sodium Stannate	200 – 300 ppb	Pass

***Our Hydrogen Peroxide is considered un-stabilized because it is very slightly stabilized with Sodium Stannate, 500 ppb maximum, just for safety purposes.

Date of MFG: 8/2022 Retest date: 8/2024

Gína M. Rambo Office Manager

CORCO CHEMICAL CORPORATION. 299 CEDAR LANE. FAIRLESS HILLS, PA 19030. 215-295-5006. FAX 215-295-0781

m/z->	N.5 6	m/z-≯ 5.0E5	ភ. ០ ពេស	m/z-> 1.0≣6	5000	1.0트4	1. Chromium(III) nitrate nonahydrate (Cr)	Compound	Volume sho	Expiration Date: Recommended Storage: Nominal Concentration (Jug/mL):	Par De	CERTIFIED WEIGHT REPORT:	www.absolutestandards.com
N 10		110		1		[1] Spectrum No.1		Pa	Volume shown below was diluted to (mL):	Expiration Date: nended Storage: ntration (µg/mL):	Part Number: Lot Number: Description:	0	3
220		120		N. O		-	58124 071122	Part Lot Number Number	filuted to (mL):	060526 Ambient (20 °C) 1000	<u>58024</u> 060523 Chromium (Cr)		A
230		130		ů. O		31,393 80	0.1000	Dilution Factor	2000.02		1 (Cr)		MS
240		140				c]:57024.	200.0 0.084	Initial Uncertainty Vol. (mL) Pipette (mL)	0.058 Flask U				MS658
				ð.		31,393 sec]:57024.D# [Count] [Línear]	084 1000	Uncertainty Nominal Pipetta (mL) Conc. (µg/mL)	Flask Uncertainty		21110221 2.0%	Lot #) A
N 50		」 () () () () () () () () () ()		S		t] [Linear]	10 10000.1	nał Initial g/mL) Conc. (µg/mL)		(mL)	221 Nitric Acid % 40.0	# Solvent:	
200		160		0		ş	0.1 1000.0	al Final rg/mL) Conc. (µg/mL)		Ľ	Acid .0 Nitric Acid	ent:	123
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		180		8- 0-		1	7789-02-8) CAS		a la	Horner		
		190		Ŷ				jolvent Os		ten	Lawrence Barry		Y
		20- 00-		100			0.5 mg(Cr)/m3 ort-	SDS Information nt Safety Info. On Attac OSHA PEL (TWA)		Ø	nce Barry		AH-15: https://Ab
		0		o			ort-rat 3250 mg/kg	ched pg.) LDS0	00000	00050	060523		AH-1539 Certificate Number https://Absolutestandards.com
							g 3112a	NIST		٥ <u> </u>	[ω]	1	te Numbe dards.com

Part # 58024 Lot # 060523

1 of 2

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Absolute Standards, Inc. Certified Reference 800-368-1131 Image: Certified Reference www.absolutestandards.com Image: Certified Reference Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	andards.cor	s by Indu	ictive	y Coupled	Plasn	na Mass S	Spectr C	Certified Reference Material Ci	ICP-M	IS):	ateria	I CRM					¥	크	ANAB AR-11 ttps:///	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	034 Acc lificate N standar	lumbe ds.corr
the stype of the style						Trace N	Metals	s Verification	ation	হ	ICP-MS		/g/mL)									
AI <0.02		40,02	Dv	40.02	H	<0.02	E	40.02	- N	- -	20		A) 02	8	a)	-	-			3		
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		40.02	2 ଜ ା	40.02	323	4 4 A	N M ;	8 8 8	× 77 ·	A 40 12	រ ន រ	Sc Sm	40.02 2002	Ta s	4 4 A A	11 S 🔒						
								(T)=	(T)= Target analyte	anatyte												
Physical Characterization:	aracteriz	ation:															C	Certified by:	by:		a	
Homogeneity: No heterogeneity was observed in the preparation of this standard.	No heteroge	meity was o	observe	d in the preps	aration (of this stand	lard.										1	14	1		ľ	
 * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). 	ad value is ds, 18.2 n ation of all are prepar are prepar are certife ds should ds should ent Result.	he conc megohm d Ill standarc are me ars are me are are are me ars are me ars are me ars are me ars are me ars are me are are are me are are are me are	entrat leioniz ls. sticulou etrica .5% of .5% of .5	ed water, c ed water, c usly cleane ully using ba f the state f the state f the state and Kuyat, a Note 122	ted fro calibrat d prior alanced d value and un and un 97, U.S	red Class, ted Class, that are that are that are der appro Guideline Guideline	A glass A glass calibra priate s for E nent P	nd volume sware and ited with ites stated laborator, ivaluating vinting Off	the hi weight cond y cond fice, W	ighest p ighest p is trace itions. xpressir /ashingt	ments ourity able tr able the ton, D.	unless raw m raw m NIST 0 NIST Uncer	materials are used in Materials are used in ST (see above). ertainty of NIST 1994).	se stat re usec vve). NIST	n .							

Part # 58024 Lot # 060523

0-368-1131 vw.absolutestandards.	r ds, Inc. .com	5			(Material Cl				🕨 🛛 🖌 🖡	AB ISO 17034 R-1539 Certifica s://Absolutestan	te Nur
	DRT: Part Number Lot Number Description	*	58029 102523 Copper (C	211)			Lot # 24002546	Solvent: Nitric Acid	, , ,	1/20	in Electro	Ce_		
	xpiration Date		102526 Ambient (20 1000				2.0%	40.0 (mL)	Nitric Acid	Formulated B	y: 1 1/0 7	Benson Chan	10252	23
NIST	Test Number shown below		6UTB	2000.02	5E-05 0.058	Balance Uncert Flask Uncertain				Reviewed By Expanded		Pedro L. Rentas	10252	23
Compound		Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Uncertainty +/- (µg/mL)	(Solv CAS#	vent Safety Info. On OSHA PEL (TWA)	Attached pg.) LD50	NIST SRM
Copper(II) nitrate trihydr	rate (Cu)	58129	100223	0.1000	200.0	0.084	1000	10000.1	1000.0	2.2	10031-43-3	1 mg/m3	ori-rat 794 mg/kg	3114
1.0E6	[1] Spect	trum N	0.1 [:	33.422 s	ec]:58(029.D# [0	Count] [Li	inear]						
5.0E5														
5.0E5 m/z-> 5.0E7		0	20	30	5 8 8	40	50	60	70	5	e`o	90	100	
m/z->	a	0	20	30	3	40	50	60	70	5	BO	90	100	
m/z-> 5.0E7		10	20	30		40	150	60			80		100	
m/z-> 5.0E7 2.5E7														
m/z-> 5.0E7 2.5E7 m/z->														





ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

	Contraction of the local division of the loc	0.204					Trace M	etals	S Verifica	ition	by ICP-M	is (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	l w	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	п	<0.02	v	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	⊲0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	Т	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

Bar ? Ma

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
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Absolute Standar 800-368-1131 www.absolutestandards.		4		793. T. 999		ertified R 5 ⁻ 6 ⁻ 4 8		Naterial CR				AF AF	AB ISO 17034 A 1-1539 Certificat c://Absolutestanc	e Number
CERTIFIED WEIGHT REPO	RT: Part Number: Lot Number: Description:		<u>58025</u> 102623 Manganes	se (Mn)			Lot # 24002546	Solvent: Nitric Acid			le la cara de la cara	Ce_		
	Expiration Date: ended Storage:		102626 Ambient (20 1000				2.0%	60.0 (mL)	Nitric Acid	Formulated E	dy: Lo Z	Benson Chan	102623	
	T Test Number: shown below w	ras dilut e Part	6UTB ed to (mL): Lot	3000.41 Dilution	5E-05 0.058	Balance Uncert Flask Uncertain Uncertainty		Initial	Final	Reviewed By Expanded Uncertainty		Pedro L. Rentas SDS Inform vent Safety Info. Or		NIST
Compound		Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA		SRM
1. Manganese(II) nitrate te	trahydrate (Mn)	58125	071123	0.1000	300.0	0.084	1000	10000.1	1000.0	2.1	20694-39-7	7 5 mg/m3	ort-rat >300mg/kg	3132
5.0E6 2.5E6	[1] Spectru	im No	.1 [3	4.243 se	c]:570	25.D# [C	ount] [Lir	near]						
m/z->	10		20	30		40	50	60	70	e e e e e e e e e e e e e e e e e e e	ΒO	90	100	
5.0E7														
m/z->	110		120	130		140	150	160	170	> 1	80	190	200	
1.0E8														
5.0E7														
m/z->	210		220	230		240	250	260						





ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

-							Trace M	etals	Verifica	tion	by ICP-M	IS (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Тъ	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	П	<0.02	v	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	lr _.	<0.02	Mn	Т	Pd	<0.02	Rb	<0.02	Na	⊲0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

Ben P. M

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the balances that are calibrated with weights traceable to NIST (see above).

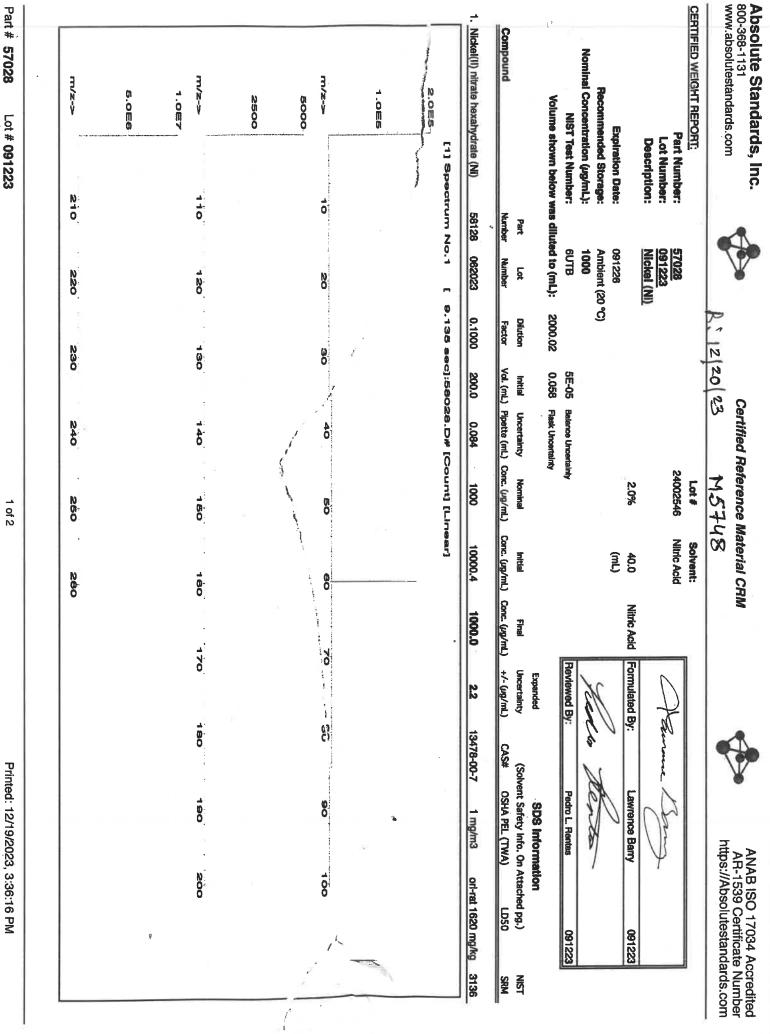
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m/z->		2.0E6	m/z->	0.0 П 14	A)]	1.0E5	m/z->	0, 0 11 12 12 12 12 12 12 12 12 12 12 12 12	1.005	1. Lead(II) nitrate (Pb)	Compound	Weight sho	NIST 1	Recommended Storage: Nominal Concentration (µg/mL):	Exc		CERTIFIED WEIGHT REPORT:	ADSOIUTE Standards, Inc. 800-368-1131 www.absolutestandards.com
21 0 220 0			110 120				10 20		[1] Spectrum No.1 [14	IN029 PBD122016A1	Lot M RM# Number Conc	s diluted to (mL):	NIST Test Number: 6UTB		Expiration Date: 100926	Lot Number: 100923 Description: Lead (Pb)		om
230			130 140				30 40		14.144 sec]:58082.D# [Count] [Linear]	1000 93.999 0.10 62.5	Nominal Purity Uncertainty Assay Conc. (µg/mL) (%) Purity (%) (%) V	3000.41 0.06 Flask Uncertainty	5E-05 Balance Uncertainty		2%			Certified Referenc
250 260			150 160 170				50 60 70		tj [Linear]	4.80071 4.80077 1000.0	Target Actual Actual Weight (g) Weight (g) Conc. (µg/mL)			(111)	60.0 Nitric Acid	46 NITHC ACID		Certified Reference Material CRM こして、20123 Mらそれチ
			0 180 190				80 00			2.0 10099-74-8 0.05 mg/m3	Expanded SDS Informa Uncertainty (Solvent Safety Info. On +/- (µg/mL) CAS# OSHA PEL (TWA)		Reviewed By: Pedro L. Rentas	Keller Hen	Formulated By: Lawrence Barry	Admine By		*
			2000				100			m3 intrvns-rat 83 mg/kg 3128	SDS Information (Solvent Safety Info. On Attached pg.) NIST # OSHA PEL (TWA) LD50 SRM		tas 100923	Ø	ny 100923	\¥		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

	DEFF12: 10205000					2 of 2							00923	Lot # 100923		Part # 57082
		are used in ove). NIST	The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. All standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).	ity raw the to Ni the Unc. (The certified value is the concentration calculated from gravimetric and volumetric measurements Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with weights traceable t Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D	netric d the d. g and I g ffice, V	and volur assware ar vrated with wise state te laborate Printing C Printing C	s A gli re califi ropria nes foi nment	or to use. S. Gover S. Gover	ated f calibr valance t and c t, C.E. 297, U	tion calcu ed water usly clear ally using f the stat and Kuya al Note 1; al Note 1;	sentrat deioniz deioniz deioniz deioniz echnic c, B.N. h S.% o c, B.N. h i. S.% o c, B.N.h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h h h h h h h h h h h h h h h h h h	The certified value is the concentration calculated from gravimetric and volume Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with w Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating a Measurement Result," NIST Technical Note 1297, U.S. Government Printing Offi	value i ion of a contain e prepa e certif keferen t Result t Result	certified preparat landard a dards ar dards ar tandards tandards suremen suremen	* The * Purifi * Stan * Stan Mea
P. S.	for the second s							ındard.	1 of this sta	paratio	xd in the pre	observe	Homogeneity: No heterogeneity was observed in the preparation of this standard.	o heterog	encity: N	Homog
Certified by:	S				Vte	get anal	(T)= Target analyte						zation:	racteri	Physical Characterization:	Physi
W 40.02 V 40.02 Yb 40.02 Yb 40.02 Zn 40.02 Zn 40.02 Zn 40.02 Zn 40.02	Ть Алл 11 Алл	e 40.2 g 40.02 a 40.02 a 40.02 a 40.02 a 40.02 a 40.02 a 40.02	40.02 Se 40.02 Si 40.02 Ag 40.02 Ag 40.02 Na 40.02 Na 40.02 Si	Rb Sm Sm	40.02 40.02 40.02 40.02 40.02	P P R P	40.02 40.02 40.02 40.02 40.02	Hg Mg	- 40.02 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7	요 한 않 날 막 発 표	40.02 40.020	~ Co Co Co 또 편 것	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	5	40.02 40.02 40.02 40.02 40.02	Al Sb Ba Bi Bi
			(µg/mL)		by ICP-MS		Verification	Metals	Trace M							
					MS):	(ICP-	trometry	s Spe	sma Mas	ed Pla	ly Couple	uctive	Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	Analy	umental	Instru
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com				CRM	Certified Reference Material C	erenc	tified Re	Ce					s, Inc.	ards.co	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	w.absol



Part # 57028 Lot # 091223 2 of 2		 * Purified acids, 18.2 megohm delonized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). 	Homogeneity: No heterogeneity was observed in the preparation of this standard.	(T) = Target aria/vie	AI A02 Cd A02 Dy A02 H A02 N T Pr A02 S A02 C4 A02 E A02 H A02 Li A02 N T Pr A02 S A02 C4 A02 E A02 H A02 Li A02 N T Pr A02 S A02 C4 A02 E A02 H A02 Li A02 N A02 N <t< th=""><th>Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS): Trace Metals Verification by ICP-MS (µg/mL)</th><th>www.absolutestandards.com</th></t<>	Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS): Trace Metals Verification by ICP-MS (µg/mL)	www.absolutestandards.com
			et .	2	Tb 40.02 Te 40.02 TI 40.02 Th 40.02 Sn 40.02 Ti 40.02		
	5 		P. S.	Certified by:	W -0.02 U -0.02 V -0.02 Yb -0.02 Yb -0.02 Yb -0.02 Zn -0.02 Zr -0.02 Zr -0.02		AR-1539 Certificate Number https://Absolutestandards.com

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	M	M5768 [M5769 (64) Certified Reference Material	ce Material CRM	42/s	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description:	<u>58112</u> 091823 Magneslum (Mg)	Solvent: 24	Lot # 24002546 Nitric Acid	Advenue	Or -
Expiration Date: 091826 Recommended Storage: Ambient (Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	20 °C)		(mL) (mL) (BF) $R - \frac{1}{3}/2\phi$	Formulated By: Heviewed By:	Lawrence Barry 091823 Pedro L. Rentas 091823
Compound	Lot Nominal I RM# Number Conc. (µg/mL)	Purity Uncertainty Assay T (%) Purity (%) (%) We	Target Actual Actual Weight (g) Weight (g) Conc. (vg/mL)	Expanded Uncertainty +/- (µg/mL) CAS	SDS Information (Solvent Safety Info. On Attached pg.) NIST # OSHA PEL (TWA) LDSO SRM
1. Magnesium nitrate hexahydrate (Mg) IN030 маюзаал	10000	99.999 0.10 8.51 23		20.0 13446-1	ng/kg 3
[1] Spectrum No.1 1.0E6		[19.923 sec]:58112.D# [Count] [Linear]	[Linear]		
а. О Ща С					
m/z-> 10	20	8	ø	70 80	90 100
1000 -		·		4	
₩/z->	120 130	140	150 160	170 180 1	190
1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0					
Part # 58112 Lot # 091823		-	1 of 2	Drintod	Drintod- 10/00/0000 0.56-15 DM

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		Inc



Certified Reference Material CRM



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Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

Γ							Trace Mo	etals	Verifica	tion	by ICP-N	1) SI	g/mL)						
									1100 100 100 100					1000	and the second s				
A	<0.02	Q	<0.02	Dy	<0.02	Hf	<0.02	5	<0.02	Ni	<0.02	7	<0.02	Se	40.2	qI.	<0.02	W	<0.02
SP	<0.02	ß	<0.2	E.	<0.02	Ho	<0.02	L	<0.02	Nb	<0.02	Re	<0.02	ŝ	<0.02	Te	<0.02	Ч	<0.02
As	<0.2	ĉ	-00.02	E	<0.02	In	<0.02	Mg]	20s	<0.02	Rh	<0.02	Ąg	<0.02	H	<0.02	V	40.02
Ba	<0.02	ß	<0.02	ନୁ	<0.02	h	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Ъ	<0.02	Υł	<0.02
Ве	<0.01	ទ	<0.02	Ga	<0.02	Fe	40.2	Hg	<0.2	٩	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	×	<0.02
B	<0.02	S	40.02	Ģ	<0.02	La	<0.02	Mo	<0.02	P	<0.02	Sm	<0.02	CM	<0.02	Sn	<0.02	G	<0.02
5	40.02	5	40.02	Au	<0.02	P	<0.02	Nd	<0.02	K	<0.2	ŝ	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* All Standards should be stored with caps tight and under appropriate laboratory conditions.

* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58112 Lot # 091823



Certified Reference Material CRM



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							Trace M	letals	Verification	Ition	by ICP-MS		(ng/mL)						
		and a second sec	State of the state			1 1 1 1 1 1 1		All and a state	The state of the s	The Property lies in	ALL NO. STATES	None of			and the second second second				And a second
R	<0.02	3	<0.02	5 D	<0.02	Hf	<0.02	Ц	<0.02	N	<0.02	Ł	<0.02	Se	<0.2	176	<0.02	M	<0.02
Sb	<0.02	J	40.2	卤	40.02	Ho	≤0.02	3	<0.02	ą	<0.02	Re	<0.02	ŝ	<0.02	Je T	<0.02	þ	40.02
As	<02	ථ	<0.02	nE	¢0.02	ч	0.02	Mg	10.0>	ő	<0.02	Rh	<0.02	Ag	<0.02	F	≤0.02	>	€0.02
Ba	<0.02	ő	<0.02	3	40.02	ㅂ	€0.02	Ma	<0.02	R	40.02	Rb	\$0.02	Ra	40 ¹²	f	<0.02	Å	<0.02
Be	F	5	40.02	ç	<0.02	£	<02	Hg	<02	ይ.	<0.02	Ru	≤0.02	ş	<0.02	Tm	<0.02	×	<0.02
Bi	40.02	රී	<0.02	පී	<0.02	4	40.02	Mo	<0.02	đ,	40.02	Sm	≤0.02	s	<0.02	rs.	<0.02	Zu	\$0.02
æ	<0.02	ð	<0.02	Au	<0.02	£	€0.02	PN	<0.02	М	<0.2	Sc	40.02	Ta	<0.02	F	\$0.02	2	0.02
									(T) = Tarr	get anal	yte								

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
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Part # 57050 Lot #	m/z->	N 01 11 12	5.0E4	1.0E5	171/2-> 2.065	N O M O	а. О П С	1. Ammonium hexatluorostannate(IV) (Sn)	Compound	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below w	CERTIFIED WEIGHT REPORT Part N Lot N Desc	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
Lot # 071123	210		110 120		0 No		[1] Spectrum No.1	(W) (Sn) INO10 SND042023A1	Lot RM# Number	Expiration Date: 071126 Pecommended Storage: Ambient (20 °C) Concentration (µg/mL): 1000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	<u>PORT:</u> Part Number: <u>57050</u> Lot Number: <u>071123</u> Description: <u>Tin (Sn)</u>	s.com
	NGO		130		e e		[15.034 sec]:	1000	Nominal Conc. (µg/mL)	0 °C) 499.93	2	V
	240		140		ð		15.034 sec]:58150.D# [Count] [Linear]	99.999 0.10 44.2	Purity Uncertainty Assay (%) Purity (%) (%)	5E-05 Balance Uncertainty 0.058 Flask Uncertainty	Solvents:	Certifi
	2 0 2 0 0		150 160		8		unt) [Linear]	1.13107	r Target Actual Weight (g) Weight (g)	(mL)	Lot # 21110221 22D0562008	Certified Reference Material
			170		70			1001.6	Actual Conc. (µg/mL)	ric acid	ric acid	CRM
			180		e			16919-	Expanded Uncertainty (Solv +/- (µg/mL) CAS#	Formulated By:		6643 M
			190 200		90 100			7 mg/m3	SDS Information (Solvent Safety Info. On Attached pg.))# OSHA PEL (TWA) LD50	Benson Chan		H
			o		ŏ			NA 3161a		071123 - 071123		ANAB ISC AR-1539 https://Absc
							1	∞ ∥.				ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com		Ce	Certified Reference Material CRM	al CRM		ANAB ISO 17034 Accredited
www.absoiutestandards.com	5				V	AR-1539 Certificate Number https://Absolutestandards.com
Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	iductively Coupled	Plasma Mass Spe	trometry (ICP-MS):			
		Trace Metals	Is Verification by ICP-MS	P-MS (µg/mL)		
AI <0.02 Cd <0.02	areas a	4003				
		0 0 0 0 0 0 0 0 0	<0.02 Ni 0.02 Nb		Se 40.2 Th Si 40.02 Te	
2 2 6			<0.01 Os <0.02 Pd	Rb Rb		\$ < c
	Ga 40.02		40.2 P	Sm Sm		
			(T) = Tamet		Ta <0.02 Ti	-0.02 Zr0.02
Physical Characterization:						
Homogeneity: No heterogeneity was observed in the preparation of this standard.	s observed in the prepa	ration of this standard.				//
ž	₹,					mr P Aller
		ł			2.	
					*	
 * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are politored with using balances. 	icentration calculate deionized water, ca rds. neticulously cleaned	ed from gravimetric librated Class A gla prior to use.	and volumetric measurem ssware and the highest pu	ents unless otherwise stated. Irity raw materials are used in	e stated.) used in	

Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
 All standards should be stored with caps tight and under appropriate laboratory conditions.
 Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 57050 Lot # 071123

2 of 2

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redited Jumber ds.com	NIST SRM	3113		
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	Formulated By: Lawrence Barry 091923 Formulated By: Lawrence Barry 091923 Reviewed By: Pedro L. Rentas 091923 Expanded SDS Information Uncertainty (Solvent Safety Info. On Attached pg.) N +/- (ug/mL) CAS# 0SHA PEL (TWA) LD50 S	ng/kg	180 B0 190 200 200 200	Printed: 2/8/2024, 5:01:14 PM
AM I'VI 58001	Nitric Acid	1000.0		
Certified Reference Material CRM 02109124	Solvent: Nttric Acid 40.0 (mL) httal bittal Conc. (ug/mL)	10000.0		
artified Reference 0 Z 0 9 1 2 4	Lot # C 24002546 2.0% 2.0% Nominat Nominat Conc. (rg/mL)	1000	34.243 eec]:58027.D# [Count] [Linear] 30 40 50 130 140 150 230 240 250	1 of 2
Certified F		0.084	240 240 240	
Å	5E-05 0.058 on Initial or Vol. (mL)	00 200.0	3 eec]:55 230 30 23 130	
	57027 091923 Cobait (Co) 091926 Ambient (20 °C) 1000 6UTB 6UTB 6UTB d to (mL): 2000.02 Lot Dilution Lot Dilution	23 0.1000		
	57027 091923 Cobalt (Cobalt (Ambient Ambient 1000 6UTB ss diluted to (mL Part Lot	58127 050923		
Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description: Cobait (C Cobait (C 091926 Recommended Storage: Nominal Concentration (µg/mL): Nominal Concentration (µg/mL): Nominal Concentration (µg/mL): COTB NIST Test Number: COTB CODB	1. Cobatt(II) nitrate hexahydrate (Co) 58		<pre>Part # 57027 Lot # 091923</pre>

Certified Reference Material CRM



ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS);

L			www.	4	2000		400			-	000	-					and the second se		
_	20.02	3	20.05	5	20.02	Ħ	<0.02	Ξ	40.0Z	ź	40.02	£	40.02	8	40.2	ß	₫0.02	M	60.02
_	40.02	రో	4 02	山	€0.02	Ho	<0.02	5	<0.02	Ż	€0:02	Re	<0.02	3	≤0.02	Ъе	<0.02	D	<0.02
_	6 6	ඊ	€0.05	圕	<0.02	Ч	<0.02	Mg	<0.01	ő	≤0.02	Rh	≤0.02	Ag	40.02	F	<0.02	Ż	<0:02
_	€0.02	చి	≤0.02	ઝ	600	ы	<0.02	Mn	<0.02	P	40,02	ß	<0.02	Na	40.2	đ	<0.02	Ŗ	<0.02
	<0.01	გ	≤0.02	g	20.0 2	ङ	4 02	Hg	40.2	۵.	40.02	Ru	<0.02	ي.	≪0.02	Ta	<0.02	Y	€0.02
	<0.02	ර	£-	ö	40.02	Ľ	40 C2	Mo	<u>60.02</u>	æ,	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Z	<u>6.02</u>
	<0.02	õ	<0.02	Au	40.02	£	40.02	PN	40.02	м	40.2	S	40.02	Ľ	40.02	F	40.02	72	2002

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

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Certified by:

Printed: 2/8/2024, 5:01:04 PM	1 of 2	323	Part # 57033 Lot # 111323
NOO	230 240 250	210 220	m/z->
			0 0 0
160 170 180 190 200	130 140 150	110 120 1	m/≊-> 1000
			ט נק 4
80 70 80 100	30 40 50	10 20	m/z-> 5.0⊑4
			1.0
	34.433 sec]:57033.D# [Count] [Linear]	[1] Spectrum No.1 [34.433	2.065
1000.0 2.0 7440-38-2 0.5 mg/m3 orl-rat	400.0 0.084	58133 020522 0.1000	1. Arsenic (As)
Expanded SDS Information Initial Final Uncertainty (Solvent Safety Info. On Attached pg.) Conc. (ug/mL) Conc. (ug/mL) +/- (ug/mL) CAS# OSHA PEL (TWA) LD50	11	Part Lot Dilution Number Number Factor	Compound
Reviewed By: Pedro L. Rentas 111323	5E-05 Balance Uncertainty 0.06 Flask Uncertainty	Volume shown below was diluted to (mL): 4000.0	Volume show
Head in Hearter			Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):
80.0 Nitric Acid Formulated By: Lawrence Borne 411000	24002546 2.0%	Part Number: 57033 Lot Number: 111323 Description: <u>Arsenic (As)</u>	Pari Loi De
Solvent:	Lot <i>≢</i>		CERTIFIED WEIGHT REPORT:
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	Certified Reference Material CRM ? のス/のペ (ヱ-Ӌ) (ハ ∽ ミ	, Inc.	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com

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Certified Reference Material CRM



https://Absolutestandards.com ANAB ISO 17034 Accredited **AR-1539** Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Low P. S.

Certified by:

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 * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* All standards should be stored with caps tight and under appropriate laboratory conditions.
 * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST
 * Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 57033 Lot # 111323

N O N O O		
	220 230 240 21	m/z-> 210
		א. 5 מ
		5.068
150 160 170 180 190 200	120 130 140 18	m/z-> 110
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50 70 80 100	Ю О О	m/z->
		1.0臣4
[Linear]	4o.1 [12.275 sec]:58105.D# [Count] [Linear]	[1] Spectrum No.1 2.0E4
11.55772 11.56201 1000.4 2.0 10043-35-3 2 mg/m3 orl-rat 2660 mg/kg	IN018 BV082016A1 1000 99.9988 0.10 17.3 11.5	1. Boric acid (B) IN018 E
Expanded SDS Information Target Actual Uncertainty (Solvent Safety Info. On Attached pg.) Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50	Nominal Purity Uncertainty Assay Conc. (µg/mL) (%) Purity (%) (%)	Compound RM#
	1000 4R	
Reviewed By: Pedro L. Rentas 071123	6UTB 5E-05 Balance Uncertainty	Nominal Concentration (µg/mL): 1 NIST Test Number: 6
40.0 Ammonium hydroxide Formulated By: Benson Chan 071123	(B) 2.0%	
Solvent: MKBC8597V Ammonium hydroxide	57005 Lo 071123	CERTIFIED WEIGHT REPORT: Part Number: 5
ce Material CRM ANAB ISO 17034 Accredited M 5종14 주가 5종14	Certified Reference Material CRM	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com



Certified Reference Material CRM



https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

							Trace Me	tals	S Verifica	tion	by ICP-	Ś	(µg/mL)						
S S A	40.02	0 2 2 2 2 2	40.02	Er Dy	<0.02	Ho	4).02	臣	40.02 002	A N	40.02 20.02	R 7	A A 8 8	s: %	A ()	3 3	2 A 3 R	: ¥	40.02
	_	n (1		2 8	A	- 5		Mg	<0.01	õ	<0.02	Rh	<0.02	Ag	40.02	3	6 8 8	< 0	40.02
		다. 	A 0.02	ត្ន ខ្ល	40.02	न ⊧			20.02	3 R	40.02	R	<0.02	Na	40.2	Ţ	40.02	₽¥	<0.02
_	_	6	<0.02	ନ୍ନ	<0.02	5			3 6	7	20.02	, Ku	40.02	Sr	<0.02	Тв	<0.02	×	<0.02
		¥	<0.02	Au	<0.02	3		N a	32	4 3	<0.02	2	40.02	1 60	40.02	S	<0.02	Za	<0.02
						I		ļ			101	ą	2000	La	20.02	11	20.02	N	40.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

In P. Str

Certified by:

* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.
* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* All Standards should be stored with caps tight and under appropriate laboratory conditions.
 * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST
 * Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part #: 57005 Lot # 071123

$\begin{array}{c c c c c c c c c c c c c c c c c c c $	m/z->	2500	m/z->	500	m/z->-	2.5 114	5.OE4	1. Ammonium dihydrogen phosphate (P)	Compound	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	CERTIFIED WEIGHT REPORT: Par Lo De	www.absolutestandards.com
R I D 2 M 4 C h M 52 15 Interview Lat* Solvent: 2111021 Nitric Acid Proves (P) 2% 40.0 Nitric Acid Solvent: 2111021 Nitric Acid Proves (mL) Solvent: 2111021 Nitric Acid Proves (mL) Solvent: 2111021 Nitric Acid Proves (mL) Nominia Park Uncertainty Actual Actual Actual More analy (S) Perfore (MR) Difference (MR) Nominia Park (S) May (N) Maight (g) Maight (g) Conc. (ug/mL) CSR Mark Pit Lawrence Ba Conc. (ug/mL) Actual Actual Actual More analy (S) Mark Pit Immunia Perfore (S) Mark Pit 12.074 aeoc) 1560 11 5. D* (Count) (Linear) Solvent Safety M Solvent Safety M 12.074 aeoc) 1560 11 5. D* (Count) Solvent Safety M Solvent Safety M Solvent Safety M 13.0 40 Sol sol To Solvent Safety M Solv	N O		110		10		[1] Spectrum			Expiration Date: Recommended Storage: I Concentration (µg/mL): NIST Test Number: Weight shown below was d	DRT: Part Number: Lot Number: Description:	om
RICZINGLA MITELS Bolvent: 21110221 Nitric Acid IDP 2% 40.0 Nitric Acid SEC5 Balance locentary (mL) Nitric Acid Formulated Br. Formulated Br. SEC5 Balance locentary (mL) Nitric Acid Formulated Br. Lawrence Balance (mL) Formulated Br. Lawrence Balance (mL) Formulated Br. Lawrence Balance (mL) Source It Mitels Acid Formulated Br. Lawrence Balance (ML) Source It Mitels Acid Formulated Br. Lawrence Balance (ML) Source It Mitels Acid Formulated Br. Formulated Br	2220		120		N. O				Lot Number	041726 Ambient (20 10000 6UTB 6UTB	57115 041723 Phosphore	5
Hric Acid Iric Acid Iric Acid Iric Acid Iric Acid Actual Actual Actual Expanded Expanded Expanded SDS Inf Expanded SDS Inf Solvent Safety Inf eight (g) Conc. (ug/mL) · (AS# OSHA PEL) 2.7289 10000.0 20.0 7722-76-1 5 mg/m 2.7289 10000.0 20.0 7722-76-1 5 mg/m 150 170 180 190 190 190	230		130		ຜ. ວ		2.074 sec]:58			00.02	us (P)	R
Hric Acid Frite Acid Formulated By: Lawrence Ba Formulated By: Pedro L. Ren Expanded Actual Uncertainty (Solvent Safety Inf eight (g) Conc. (ug/mL) - 4/- (ug/mL) CAS# OSHA PEL 2.7289 10000.0 20.0 7722-76-1 5 mg/m 2.7289 10000.0 1722-76-1 5 mg/m 160 170 180 190 190	240		140		4		3115.D# [Cot		Uncertainty Assay Purity (%) (%)	2% Balance Uncertainty Flask Uncertainty	Solvent:	22/09/12
Formulated By: Lawrence Ba Formulated By: Lawrence Ba Reviewed By: Pedro L. Ren Conc. (ug/m), -/- (ug/m), CAS# OSHA PEL 10000.0 20.0 7722-76-1 5 mg/m 10000.0 20.0 7722-76-1 5 mg/m 10000.0 eio eio	250		150		S O		ınt] [Linear]					
Formulated By: Lawrence Ba Formulated By: Pedro L. Ren Expanded SDS Inf Uncertainty (Solvent Safety Inf +/- (ug/mL) CAS# OSHA PEL (20.0 7722-76-1 5 mg/m 20.0 7722-76-1 5 mg/m 20.0 190 90	260							2.7289 10000.	Actual Actual sight (g) Conc. (µg/1	rric Acid	tric Acid	15815
22-76-1 5 mg/m					1			20.0		Formulated B	Q	
o 200			4						SC (Solvent Saf CAS# OSH/	Ped	Gerence /	
.hed pg.) LbS0 LbS0									DS Information fety Info. On Attac A PEL (TWA)	L. Rentas	Jan	https://At
g 3186 SRM			9		J				0	041723 041723		tps://Absolutestandards.com

Abs	Absolute (800-368-1131 www.absolute	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	lards , ds.com	Inc.	-				ĉ	rtified Re	eren	Certified Reference Material CRM	ial CR	M					https AF	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	4 Accredited cate Number andards.com
-	nstrum	iental A	nalysi	s by Indi	uctive	ły Coupl	ed Pla	Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS);	s Spec	troscopy	(ICP	-MS):									
_								Trace Metals	etals	Verifica	Ition	Verification by ICP-MS	1.00	(µg/mL)							
-	A	40.02	8	40,02	Ą	40.02	H	40.02	E	A) ()2	Z	A)22	7	A).02	Se	A 2	ŧ	AB	W		
		A.22	5 2	A0.2	ម្មា	40.02	Но	40.02	Ŀ	40.02	NB	<0.02	Re	40.02	ŝ	40.02	Te	40.02	c :	40.02	
	Ba		<mark>ዮ</mark> የ	8 8 8 8	<u>ନ</u> ଜ	40.02 20	부 분	40.02 20	Mg	40.01 002	r S	A A 3 2	₽ ₽	A A 3 S	Å.	A) 02	1 11	A 600	\$ <	8 8	
		10.0>	ព្	<0.02	ណ្ឌ	<0.02	놂	<0.2	Hg	40.2	שי	T	R Q	40.02	K 2	8.8 2		<0.02	4 'B	60.02 20.02	
	B	8 8 22 22	5 S	8 8 22 22	ନ ବ	40.02 20	32	4 4 A	N W	4 4 8 8	* 7	A0.02	s s	A A 3 S	, s	88	1 S	A A A A	2 B	88	
										(T)= Ta	(T)= Target analyte	alyte			ĺ						
hand	hysical	Physical Characterization:	cteriza	ution:														Cer	Certified by:	y:	
	Iomogen	eity: No I	heteroge	neity was	observ	ed in the pr	eparati	Homogeneity: No heterogeneity was observed in the preparation of this standard.	ındard.								(h	J.	Ŵ	
* *	The cel Purified	rtified va l acids,	alue is 18.2 m	The certified value is the concen Purified acids, 18.2 megohm dei the menantion of all standards	centrat deioniz	tion calcul red water,	lated f	The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all etandarde	metric s A gla	and volu	metric nd the	measure highest p	nents Jurity r	unless oth aw mater	nerwisc ials are	e stated. 9 used in					
* * * * *	All star Standa Standa All Star Uncerta Measur	ndard co rds are rds are ndards s ainty Re rement	ntaine prepare certife hould I ference Result,	rs are me ad gravin d (+/-) 0 es storec s: Taylor " NIST Te	eticulo netrica).5% o d with r, B.N. echnic	ally using the stat caps tigh and Kuya al Note 1;	hed pri balanc iced val it and it, C.E. 297, L	 * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. * All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). 	e calit other ropriat nes for nment	brated wit wise stat te laborat Evaluatir Printing (h weig ed. ory co Office,)hts trace onditions. Expressir Washingt	able to og the l on, D.(to NIST (see above). e Uncertainty of NIST D.C. (1994).	e abov ty of N	e). IIST					
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Part #	57115		Lot # 041723	1723							2 of 2	of 2					Print	Printed: 2/8/2024, 5:01:22 PM	24, 5:0)1:22 PM	

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m/z->	N. 01 00	5. O M 8	m/z->	5.0E7	1.0E8	m/z->	N. 00 00	5.0E5	Ammonium sulfate (S)	Compound	NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):	Part Number: Lot Number: Description:	800-368-1131 www.absolutestandards.com
210			110			10		[1] Spectrum No.1	IN117	RM#	umber: low was dilute	n Date: lorage: lg/mL):	<u>Part Number:</u> Lot Number: Description:	
220			120			NO		-	IN117 SLBR7225V	Lot Number C	GUTB d to (mL):	122926 Ambient (20 °C) 1000	<u>57016</u> 122923 Sulfur (S)	
230			130		9	30		33.603 80	1000	Nominal F Conc. (µg/mL)	4000.0 5	ĉ		<i>b</i>
N 40			140			b	den gegen og gener første kommen och som en forse og	33.603 sec]:57016.D# [Count] [Linear]	99.9 0.10 24.3	Purity Uncertainty Assay (%) Purity (%) (%)	5E-05 Balance Uncertainty 0.06 Flask Uncertainty		Solvent:	Certified Re
N 80			100			50		Count] [Lin	.3 16.4979	say Target 6) Weight (g)	Y		Lot # 122923	fere 12
N80			0			8		9 9 7	16.4980	Actual Weight (g)			ASTM Type 1 Water	aterial CRM
			170			70			1000.0	Actual (Conc. (µg/mL)	5		1	rm 167816-
			180			80			2.0 77	Expanded Uncertainty +/- (µg/mL)	Reviewed By:	M	Formulated By:	
						 Complete and complete 			7783-20-2	(Solvent : CAS# 05	Pedr	\$	a and a second sec	
			190			0			NA	SDS Information It Safety Info. On Attac OSHA PEL (TWA)	Pedro L. Rentas	e la	Benson Chan	http
			2000			100			ort-rat 4250mg/kg 3181	SDS Information (Solvent Safety Info. On Attached pg.) * OSHA PEL (TWA) LD50	122923	7	100002	AR-1539 Certificate Number https://Absolutestandards.com

1 of 2

Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).	 * All standard containers are meticulously cleaned prior to use. * All standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All standards should be stored with caps tight and under appropriate laboratory conditions. * All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST 	 The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the measurement of all standards 		Homogeneity: No heterogeneity was observed in the preparation of this standard.	Physical Characterization:	(T) = Target analyte	AI A002 Cd A002 Pr A002 Pr	Trace Metals Verification by ICP-MS (µg/mL)	Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
30			5 2	I She	Certified by:		MI MI<			ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

2 of 2

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	-	260	250	240	230		220	210	m/z->
									1.0巨5。
									2.0厘5
180 190 200	170	160	150	140	130	р. 9	120	110	m/z->
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									5.0E5
80 80 100	70	eo	50	40	8	magan Raji Anana ya Anany	N	10	m/z->
									1000
		ear)	ount] [Lin	24.004 sec];58116,D# [Count] [Linear]	¢ sec];58	[24.00		[1] Spectrum No.1	2000
20.0 7763-20-2 NA orf-rat 4250mg/kg 3181	10000.1	82,4682	82.4675	0.10 24.3	99,9	10000	IN117 SLBR7225V	IN1	1. Ammonium sulfate (S)
Expanded SDS Information Uncertainty (Solvent Safety Info. On Attached pg.) NIST +/- (ug/mL) CAS# OSHA PEL (TWA) LDSO SRM	(g) Conc. (µg/mL)	Actual Weight (g)	Target Weight (g)	Uncertainty Assay Purity (%) (%)	Purity (%)	Nominal Conc. (µg/mL)	Lot. Number	RM#	Compound
i By: Ped	[F			Balance Uncertainty Flask Uncertainty	0.058	1999.48	led to (mL):	Weight shown below was diluted to (mL):	Weight show
Lawrence barry	1 1					20 °C)	071126 Ambient (20 °C) 10000 Sum	Expiration Date: nended Storage: htration (µg/mL): %T Test Number:	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Teet Number
around Bring	Type 1 Water	ASTM Ty	Lot# 071123	Solvent:		E)	57116 071123 Sulfur (S)	<u>PORT:</u> Part Number: Lot Number: Description:	CERTIFIED WEIGHT REPORT: Part N Lot N Desc
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	CRM		ference M	Certified Reference Material	R a			om	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
								And in case of the local division of the loc	

800-368-1131 www.absolutestandards.com		0	Certified Reference Material CRM	nce Material C	RM			•	ANAB ISO 1: AR-1539 Ce https://Absolut	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	ictively Coupled	Plasma Mass Sp	ectrometry (IC	P-MS):						
		Trace Metals		Verification by ICP-MS	IS (µg/mL)					
AI <0.02 Cd <0.02	Dv 40.02	A M	-12			a dista div.	ALL MERCY		A STREET STREET STREET	
40.02 Ca		40.02	40.02 40.02	Ni <0.02 Nb <0.02	Pr <0.02 Re <0.02	Si Se				A 6.3
50 C C	Gd <0.02	In <0.02 N	Mg <0.01 C						< 0	<0.02
40.02	Ga 40.02	Fe <0.2 Hg	A A 3 12	8 8			12 1		40.02 Y 40.02	40.02 20.02
B (UUZ CI 40,02	Au <0.02	<0.02	<0.02		Sc <0.02	Ta o	<0.02		40.02 21 21 40	40.02
Physical Characterization:			(T)= Target analyte	alyte				۲ ۲	Certified by:	
Homogeneity: No heterogeneity was observed in the preparation of this standard.	oserved in the prepa	ation of this standard								1
							(the second	P.S.	
 * The certified value is the concentration calculated from gravimetric and volumetric measurements * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity in the preparation of all standards. * All standard containers are meticulously cleaned prior to use the preparation of the preparation of all standards. 	ntration calculate ionized water, ca	d from gravimetri librated Class A g	c and volumetric lassware and the	c measurement highest purity	s unless otherwise stated. raw materials are used in	ise state are used i	5.6			
* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.	trically using bala % of the stated	value, unless othe	brated with weighwise stated.	phts traceable :	to NIST (see ab	ove).				
* Uncertainty Reference: Taylor, Measurement Result," NIST Tec	vith caps tight ar B.N. and Kuyat, (hnical Note 1297	id under appropria 2.E., "Guidelines fc , U.S. Governmen	ite laboratory co r Evaluating and t Printing Office,	I Expressing the Washington, D	⁹ Uncertainty of NIST).C. (1994).	F NIST				
	·									
		ð								
* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. * All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.	itrically using bails bails of the stated with caps tight ar B.N. and Kuyat, C hnical Note 1297	prior to use. ances that are cali value, unless othe d under appropria 2.E., "Guidelines fo , U.S. Governmen	brated with weig rwise stated. re laboratory co or Evaluating and t Printing Office, t Printing Office,	ghts traceable . onditions. I Expressing the Washington, D	to NiST (see ab 3 Uncertainty o).C. (1994).	ove). F NIST				

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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	m/z>	ζι Ο Μ Ο	m/z-> 1.0E6	m/≥-> 2.0E6 1.0E6	5000 2500	Compound 1. Ammonium hexafluorosilicate (Si)	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	<u>CERTIFIED WEIGHT REPORT:</u> Part Nu Lot Nu Descri	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
Certified Reference Material CRM A: 12: p 4: 2.4 Ph/SI R Solvent: 24002546 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 1140 1140 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.9 111 12.9 111 12.9 111 13.865 111 14.0 111 14.0 111 14.0 111 11.9 <th></th> <th></th> <th></th> <th></th> <th></th> <th>Lot RM# Number IN009 SID082022A1</th> <th>s dilute</th> <th>mber: mber: ption:</th> <th>, Inc.</th>						Lot RM# Number IN009 SID082022A1	s dilute	mber: mber: ption:	, Inc.
Instant Image: Constraint of the con	≥40		140	4	1.393 sec]:58014.D# [Count]	Purity Uncertainty Assay (%) Purity (%) (%) 99.999 0.10 14.4	2% 5E-05 Balance Uncertainty 99.48 0.058 Flask Uncertainty		Certified Reference
v: Aleah O'Brady V: Aleah O'Brady CAS# OSHA PEL (TM 919-19-0 2.5 mg/m: 919-19-0 150	N		160	0- 	Linear]	Actual Actual Weight (g) Conc. (Jy/mL) 13.8855 1000.0	Nitric Acid	Nitric A	182
			(*)			(Solvent S CAS# () 18919-19-0	Ped Ped	ha	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

≤ % >



Certified Reference Material CRM



https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS);

							Trace M	etals	Verifica	ition	by ICP-N	E S	ia/mL)						
				A COLUMN TO A COLUMN			Contraction of the local distance of the loc		Contraction of the						No. of Concession, Name	UNIVERSITY	A REAL PROPERTY AND INCOME.	No. of Concession, Name	STOLEN STOLEN
A	<0.02	8	<0.02	Dy	<0.02	Hf	<0.02	Ľ	<0.02	N	40.02	Pr	<0.02	Se	<0.2	7	4) 02	W	AND
S	40.02	ç	e,	Į	3	ç	3	-	3	,		1				•0	1000	-	70.02
: 8) <u>(</u>	101	R	20.02	OL	<0.02	Ę	<0.02	ß	<0.02	Re	<0.02	ŝ	ч	ē	<0.02	q	<0.02
25	202	ຣ	<0.02	5	40.02	F	40.02	Mg	<0.01	ç	40.02	R	A).02	Ag	40.02	1	4033	<	3
Ba	40.02	ຊ	<0.02	ନ୍ଥ	40,02	- -1'	3	\$	3	ž	23	P	3	4		1			
đ	5	2	5	>		1						200	20.00	TAG.	101	10	20.02	10	20.02
Į	TOTON	5	<0.02	G	20.02	re	40.2	Нg	40.2	'n	40.02	Ru	<0.02	\$	A 0.02	ľ	40.02	~	4) M
Bl	40.02	S	<0.02	ନ୍ନ	A)02	5	40.02	Mo	40.02	¥	40.03	2	2002	2	3	2	3	2	3
7	33	2	3	Å.,	3	Ż	3		2	1 ;				,	10.02	22	10.04		20.02
F	-UNE	4	20.02	70	20.02	10	20.02	Nd	AU.U2	×	40.2	8	<0.02	Ta	40.02	H	40.02	2	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

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Certified by:

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

* All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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Part # 57014 Lot # 122023



1 of 2

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Certified Reference Material CRM



AR-1539 Certificate Number https://Absolutestandards.com ANAB ISO 17034 Accredited

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

Al 40.02 Sb 40.02 As 40.02 Ba 40.02 Ba 40.02 Be 40.01 Bi 40.02 B 40.02	
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(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

* All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* All standards should be stored with caps tight and under appropriate laboratory conditions.

* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58030 Lot # 111623

Image:	TT/Z->	2500	5000	m/z->	500	 1000	N.00 M.4	5.0E4	1. Ammonium dihydrogen phosphate (P) IN008 PvœzoisAi	Compound	Weight shown below was diluted to (mL):	NIST Test Number:	Recommended Storage: Nominal Concentration (ug/mL):	Expiration Date:	Lot Number: Description:	CERTIFIED WEIGHT REPORT: Part Number:	www.absolutestandards.com
ric Acid Fic Acid Formulated By: Formulated				120		20				Lot Number							R
ric Acid Fic Acid Formulated By: Formulated	240			140		40			89.899 0.10 27.5 7.275	Purity Uncertainty Assay (%) Purity (%) (%)	0.058 Flask Uncertainty	5E-05 Balance Uncertainty					00
Prieved By: Programity Procertainty Procentainty Processory P									.2730	Actual Actual Weight (g) Conc. (µg/mL)				Nitric Acid			M5820
				180					7722-76-1) CAS			Here ten	Lawrence	forme (٩

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														5		· · ·		Ð			
					e). IST	rials are e abov ity of N	ity raw materials are us le to NIST (see above). the Uncertainty of NIST , D.C. (1994).	able to g the l on, D.(highest p ts trace; ditions. Xpressin Vashingt	id the f id. yry con y and E ffice, V	sware ar ated with ise state laborate ivaluation rinting O	A glas calibr otherw opriate is for E ment P	ed Class to use. that are , unless (der appro Guideline Governr	calibrat ad prior alances d value and un , C.E., " 97, U.S	d water, sly clean y using b y using b the state the state hps tight nd Kuyat Note 12	eionize Is. ticulou: ticulou: 5% of 1 S% of 1 B.N. a chnical	 Purmed acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). 	8.2 me of all s repared ertifed ertifed prence: esult,"	acids, 1 aration s are pi s are ci ards sh nent Refe	 Purmed acids, 18.2 meg the preparation of all si All standard containers Standards are prepared Standards are certifed (All Standards should be Uncertainty Reference: Measurement Result," Measurement Result, " Measurement Result," 	* * * * * *
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QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program"

Instructions for QATS Reference Material: Inorganic ICV Solutions

QATS LABORATORY INORGANIC REFERENCE MATERIAL INITIAL CALIBRATION VERIFICATION SOLUTIONS (ICV1, ICV5, AND ICV6)

These instructions are for advisory purposes only. If any apparent conflict exists between these NOTE: instructions and the analytical protocol or your contract, disregard these instructions.

- **APPLICATION:** For use with the CLP SFAM01.0 SOW and revisions.
 - CAUTION: Read instructions carefully before opening bottle(s) and proceeding with $\frac{1}{2}$ M5528 - 3 M5528 - 3 M553 - 3130 123 the analyses.

Contains Metals in Dilute Acidic or Cyanide in Basic Aqueous Solutions HAZARDOUS MATERIAL

> Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more Aqueous Inorganic Reference Materials containing various analyte concentrations. ICV1 and ICV5 are in a matrix of dilute nitric acid. ICV6 is in a matrix of dilute basic solution. For the reference material source in reporting ICVs use "USEPA". For the reference material lot number for the ICV1, ICV5, and ICV6 solutions use "ICV1-1014", "ICV5-0415", and "ICV6-0400", respectively.

(B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided

QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY **APTIM Federal Services, LLC** 2700 Chandler Avenue - Building C Las Vegas, NV 89120

(C) ANALYSIS OF SAMPLES

The Initial Calibration Verification Solutions (ICVs) are to be used to evaluate the accuracy of the initial calibrations of ICP, AA, and Cyanide colorimetric instruments, and are to be used with the CLP SOWs and revisions. The values for each element in the ICVs are listed below in µg/L (ppb) for the resulting solution(s) after the dilution of the concentrate(s) according to the following instructions. Use Class 'A' glassware to prepare the solution(s).

ICV1-1014 For ICP-AES analysis, use a 10-fold dilution by pipetting 10 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric

RMs ICV 1, 5, 6 SFAM (1)

Page 1 of 2

QATS Form 20-007F188R00, 04-19-2021



The Quality Assurance Technical Support (QATS) contract is operated by APTIM Federal Services, LLC.



QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program"

APTIM	Instructions for a reason
ICV1-1014	Instructions for QATS Reference Material: Inorganic ICV Solutions
	For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.
ICV5-0415	For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K ₂ Cr ₂ O ₇ and 5% (v/v) nitric acid.
	For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from $K_3Fe(CN)_6$, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

NOTE: USE TYPE II WATER AND HIGH-PURITY ACIDS FOR ALL DILUTIONS.

(D) CERTIFIED CONCENTRATIONS OF QATS ICV1, ICV5, AND ICV6 SOLUTIONS

	ICV1-1014	
Element	Concentration (µg/L) (after 10-fold dilution)	Concentration (µg/L)
AI	2500	(after 50-fold dilution)
Sb	1000	500
As	1000	200
Ba	520	200
Be	510	100
Cd	510	100
Ca	10000	100
Cr	520	2000
Co	520	100
Cu	510	100
Fe	10000	100
Pb	1000	2000
Mg	6000	200
Mn	520	1200
Ni	530	100
K	9900	110
Se	1000	2000
Ag	250	200
Na	10000	50
TI	1000	2000
V	500	210
2n	1000	100
	1000	200

	ICV5-0415		ICVIC DADD
Element	Concentration (µg/L) (after 100-fold dilution)	Analyte	ICV6-0400 Concentration (µg/L) (after 100-fold dilution)
Hg	4.0	CN [.]	99

	m/z-> 210	1.0E8	N. O E B	m/z-≻ 110	-1 -0 	m/z-> 10 2.0E8	1.0 [[]4	[1] Spectrum No.1 2.0E4	1. Selenium (Se)	Compound	Volume shown below was diluted to (mL):	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):	Lot Number: Description:	CERTIFIED WEIGHT REPORT:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
	0			o		J .		um No	58134	Part Number	6 as diluted			л	
220				120		12 0		-	071223	Lot Number	ed to (mL):	060627 Ambient (20 °C) 1000	<u>060624</u> Selenium (Se)	7024	V
	N			4		ω		33.702	0.1000	Dilution Factor	2000.07	ĉ	(Se)		
	230			130		80		90C]:58	200.0	Initial Vol. (mL)	5E-05 0.100				
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	260			160		60		inear]	10002.5	Initial Conc. (µg/mL)		(mL)	40.0	Solvent:	Certified Reference Material CRM からすチェート・アンの
				170		70			1000.0	Final Conc. (ug/mL)	11		Nitric Acid		114
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				190		90			0.2 mg/m3	SDS Information nt Safety Info. On Att: OSHA PEL (TWA)	Pedro L. Rentas		Benson Chan		ਤ
				200		100			3 orl-rat 6700 mg/kg	SDS Information (Solvent Safety Info. On Attached pg.) AS# OSHA PEL (TWA) LDS0	1tas 060624	,	n 060624		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
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	The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).	The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise st. Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are us the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).	rements t purity r ceable to s. s. sing the l ngton, D.0	highes highes tra ndition: Expres Washir	volumetric re and the i with weij stated. stated. voratory cc uating and ing Office.	ric and glasswa glasswa alibratec nerwise riate lab for Evalu nt Print	 * The certified value is the concentration calculated from gravimetric and volumetric measurements unlee * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw n the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIS * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. * All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Unce Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1 	ed fron alibrate alibrates lances l value, l value, C.E., "Q C.E., "Q C.E., "Q	The certified value is the concentration calculated from gravi Purified acids, 18.2 megohm deionized water, calibrated Class the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that ar Standards are certifed (+/-) 0.5% of the stated value, unless All standards should be stored with caps tight and under app Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin Measurement Result," NIST Technical Note 1297, U.S. Gover	ntratio sionized s. etrically etrically 5% of t 5% of t B.N. a B.N. a	he conce egohm de standardd s are met d gravim (+/-) 0. e stored : Taylor, NIST Tev	alue is t 1 8.2 me n of all : ntainer: orepare certifed bould bu ference ference Result,"	The certified value is the concen Purified acids, 18.2 megohm dei the preparation of all standards. All standard containers are meti Standards are prepared gravime Standards are certifed (+/-) 0.5 All standards should be stored w Uncertainty Reference: Taylor, E Measurement Result," NIST Tech	* The c * Purifie the purifie * All stand * Stand * All stand Measu	
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		(µg/mL)	ICP-MS	-MS): on by	metry (ICP-MS): Verification by ICP-MS	s Spectrom Metals V	Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): Trace Metals Verification by	Plasma	Coupled	ctively	by Indu	nalysis	nental A	Instru	
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com		₽M	terial Cl	nce Ma	Certified Reference Material CRM	Certifie					Inc.		Absolute Standards, 800-368-1131 www.absolutestandards.com	Absolute 800-368-1131 www.absolute	800-

Nitric Acid 69% CMOS





M5963 M5964 M5965 M5966 M5967 M5968

Material No.: 9606-03 Batch No.: 24B1362001 Manufactured Date: 2024-01-25 Retest Date: 2029-01-23 Revision No.: 0

Certificate of Analysis

Assay (HNO2) $69.0 - 70.0 \%$ 69.6% AppearancePasses TestPasses TestColor (APHA) ≤ 10 5Residue after Ignition $\leq 2 ppm$ <1 ppmChioride (C1) $\leq 0.08 ppm$ <0.03 ppmPhosphate (PO4) $\leq 0.2 ppm$ <0.2 ppmSulfate (SO4) $\leq 0.2 ppm$ <0.2 ppmTrace Impurities - Aluminum (AI) $\leq 40.0 ppb$ <1.0 ppbArsenic and Antimony (as As) $\leq 5.0 ppb$ <2.0 ppbTrace Impurities - Barium (Ba) $\leq 10.0 ppb$ <1.0 ppbTrace Impurities - Barium (Bi) $\leq 20.0 ppb$ <1.0 0pbTrace Impurities - Barium (Cd) $\leq 50 ppb$ <1.0 0pbTrace Impurities - Cadmium (Cd) $\leq 50 ppb$ <1.0 0pbTrace Impurities - Cadmium (Cd) $\leq 50 ppb$ <1.0 ppbTrace Impurities - Cadmium (Ca) $\leq 50.0 ppb$ <1.0 ppbTrace Impurities - Calium (Ca) $\leq 10.0 ppb$ <1.0 ppbTrace Impurities - Cobatt (Co) $\leq 10.0 ppb$ <1.0 ppbTrace Impurities - Coper (Cu) $\leq 10.0 ppb$ <1.0 ppbTrace Impurities - Colatt (Co) $\leq 10.0 ppb$ <1.0 ppbTrace Impurities - Colat (Ca) $\leq 20 ppb$ <1.0 ppbTrace Impurities - Colatt (Ca) $\leq 20 ppb$ <1.0 ppbTrace Impurities - Colatt (Ca) $\leq 10.0 ppb$ <1.0 ppbTrace Impurities - Colatt (Ca) $\leq 10.0 ppb$ <1.0 ppbTrace Impurities - Colatt (Ca) $\leq 10.0 ppb$ <1.0 ppbTrace Impurities - Colatt (Ca) $\leq 20 ppb$ <1.0 ppbTrace Impurities -	Test	Specification	Result
AppearancePasses TestPasses TestColor (APHA) ≤ 10 5Residue after Ignition ≤ 2 ppm <1 ppmChloride (C) ≤ 0.08 ppm <0.03 ppmPhosphate (PO4) ≤ 0.10 ppm <0.03 ppmSulfate (SO4) ≤ 0.2 ppm <0.2 ppmTrace Impurities - Aluminum (A) ≤ 40.0 ppb <1.0 ppbArsenic and Antimony (as As) ≤ 5.0 ppb <2.0 ppbTrace Impurities - Barium (Ba) ≤ 10.0 ppb <1.0 ppbTrace Impurities - Beryllium (Be) ≤ 10.0 ppb <1.0 ppbTrace Impurities - Barium (Ca) ≤ 50.0 ppb <5.0 ppbTrace Impurities - Cadinum (Ca) ≤ 50.0 ppb <1.0 ppbTrace Impurities - Cadinum (Ca) ≤ 50.0 ppb <1.0 ppbTrace Impurities - Cadinum (Ca) ≤ 30.0 ppb <1.0 ppbTrace Impurities - Cadinum (Ca) ≤ 10.0 ppb <1.0 ppbTrace Impurities - Cadinum (Ca) ≤ 10.0 ppb <1.0 ppbTrace Impurities - Cobalt (Co) ≤ 10.0 ppb <1.0 ppbTrace Impurities - Collium (Ga) ≤ 10.0 ppb <1.0 ppbTrace Impurities - Gold (Au) ≤ 20 ppb <1.0 ppbTrace Impurities - Gold (Au) ≤ 20.0 ppb <1.0 ppbTrace Impurities - Gold (Au) ≤ 20.0 ppb <1.0 ppbTrace Impurities - Gold (Au) ≤ 20.0 ppb <1.0 ppbTrace Impurities - Icadinum (Ge) ≤ 20.0 ppb <1.0 ppbTrace Impurities - Collou (Ce) ≤ 10.0 ppb <1.0 ppbTrace Impurities - Collou (Ce) <td>Assay (HNO3)</td> <td>69.0 - 70.0 %</td> <td></td>	Assay (HNO3)	69.0 - 70.0 %	
Color (APHA)≤ 105Residue after ignition≤ 2 ppm< 1 ppm	Appearance	Passes Test	
Residue after Ignition≤ 2 ppm< 1 ppmChloride (Cl)≤ 0.08 ppm< 0.03 ppm	Color (APHA)		
Chloride (Cl)≤ 0.08 ppm< 0.03 ppmPhosphate (PO4)≤ 0.10 ppm< 0.03 ppm	Residue after Ignition	≤ 2 ppm	
Phosphate (PO4)≤ 0.10 ppm< 0.03 ppmSulfate (SO4)≤ 0.2 ppm< 0.2 ppm	Chloride (Cl)		
Sulfate (SO4)≤ 0.2 ppm< 0.2 ppmTrace Impurities - Aluminum (Al)≤ 40.0 ppb< 1.0 ppb	Phosphate (PO4)		
Trace Impurities - Aluminum (AI)≤ 40.0 ppb< 1.0 ppbArsenic and Antimony (as As)≤ 5.0 ppb< 2.0 ppb	Sulfate (SO4)	≤ 0.2 ppm	
Arsenic and Antimony (as As) \leq 5.0 ppb $<$ 2.0 ppbTrace Impurities - Barium (Ba) \leq 10.0 ppb $<$ 1.0 ppbTrace Impurities - Beryllium (Be) \leq 10.0 ppb $<$ 1.0 ppbTrace Impurities - Bismuth (Bi) \leq 20.0 ppb $<$ 10.0 ppbTrace Impurities - Boron (B) \leq 10.0 ppb $<$ 5.0 ppbTrace Impurities - Cadmium (Cd) \leq 50 ppb $<$ 1 ppbTrace Impurities - Calcium (Ca) \leq 50.0 ppb $<$ 1.0 ppbTrace Impurities - Cobalt (Co) \leq 30.0 ppb $<$ 1.0 ppbTrace Impurities - Coper (Cu) \leq 10.0 ppb $<$ 1.0 ppbTrace Impurities - Coper (Cu) \leq 10.0 ppb $<$ 1.0 ppbTrace Impurities - Gallium (Ga) \leq 20 ppb $<$ 1.0 ppbTrace Impurities - Gold (Au) \leq 20 ppb $<$ 10 ppbTrace Impurities - Gold (Au) \leq 20 oppb $<$ 1.0 ppbTrace Impurities - Iron (Fe) \leq 40.0 ppb $<$ 1.0 ppbTrace Impurities - Lead (Pb) \leq 20 oppb $<$ 1.0 ppbTrace Impurities - Lead (Pb) \leq 20 oppb $<$ 1.0 ppbTrace Impurities - Lead (Pb) \leq 20 oppb $<$ 1.0 ppbTrace Impurities - Lead (Pb) \leq 20 oppb $<$ 1.0 ppbTrace Impurities - Magnese (Mn) \leq 20 oppb $<$ 1.0 ppbTrace Impurities - Magnese (Mn) \leq 20 oppb $<$ 1.0 ppbTrace Impurities - Magnese (Mn) \leq 20 oppb $<$ 1.0 ppbTrace Impurities - Magnese (Mn) \leq 20 oppb $<$ 1.0 ppbTrace Impurities - Magnese (Mn) \leq 20 oppb $<$ 1.0 ppbTrace Impu	Trace Impurities – Aluminum (Al)		
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Trace Impurities - Beryllium (Be)≤ 10.0 ppb< 1.0 ppbTrace Impurities - Bismuth (Bi)≤ 20.0 ppb< 10.0 ppb	Trace Impurities – Barium (Ba)	≤ 10.0 ppb	
Trace Impurities - Bismuth (Bi) $\leq 20.0 \text{ ppb}$ $< 10.0 \text{ ppb}$ Trace Impurities - Boron (B) $\leq 10.0 \text{ ppb}$ $< 5.0 \text{ ppb}$ Trace Impurities - Cadmium (Cd) $\leq 50 \text{ ppb}$ $< 1 \text{ ppb}$ Trace Impurities - Calcium (Ca) $\leq 50.0 \text{ ppb}$ $< 0.2 \text{ ppb}$ Trace Impurities - Chromium (Cr) $\leq 30.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Cobalt (Co) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Coper (Cu) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Gallium (Ga) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Gallium (Ga) $\leq 20 \text{ ppb}$ $< 10 \text{ ppb}$ Trace Impurities - Gold (Au) $\leq 20 \text{ ppb}$ $< 50 \text{ ppb}$ Heavy Metals (as Pb) $\leq 100 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Iron (Fe) $\leq 40.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Lithium (Li) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Lithium (Li) $\leq 20 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Magnese (Mn) $\leq 20 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Magnese (Mn) $\leq 20 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Magnese (Mn) $\leq 20 \text{ ppb}$ $< 1.0 \text{ ppb}$	Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	
Trace Impurities - Boron (B)≤ 10.0 ppb< 5.0 ppbTrace Impurities - Cadmium (Cd)≤ 50 ppb< 1 ppb	Trace Impurities – Bismuth (Bi)	≤ 20.0 ppb	
Trace Impurities - Cadmium (Cd) \leq 50 ppb< 1 ppbTrace Impurities - Calcium (Ca) \leq 50.0 ppb< 0.2 ppb	Trace Impurities – Boron (B)	≤ 10.0 ppb	
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Trace Impurities - Chromium (Cr) $\leq 30.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Cobalt (Co) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Copper (Cu) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Gallium (Ga) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Germanium (Ge) $\leq 20 \text{ ppb}$ $< 10 \text{ ppb}$ Trace Impurities - Gold (Au) $\leq 20 \text{ ppb}$ $< 50 \text{ ppb}$ Heavy Metals (as Pb) $\leq 100 \text{ ppb}$ $< 50 \text{ ppb}$ Trace Impurities - Iron (Fe) $\leq 40.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Lead (Pb) $\leq 20.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Lithium (Li) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Magnesium (Mg) $\leq 20 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Manganese (Mn) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Mickel (Ali) $< 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$	Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	
Trace Impurities - Cobalt (Co)≤ 10.0 ppb< 1.0 ppbTrace Impurities - Copper (Cu)≤ 10.0 ppb< 1.0 ppb	Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	
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Trace Impurities - Germanium (Ge)≤ 20 ppb< 10 ppbTrace Impurities - Gold (Au)≤ 20 ppb< 5 ppb	Trace Impurities – Gallium (Ga)	≤ 10.0 ppb	
Trace Impurities - Gold (Au) $\leq 20 \text{ ppb}$ $< 5 \text{ ppb}$ Heavy Metals (as Pb) $\leq 100 \text{ ppb}$ $< 50 \text{ ppb}$ Trace Impurities - Iron (Fe) $\leq 40.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Lead (Pb) $\leq 20.0 \text{ ppb}$ $< 10.0 \text{ ppb}$ Trace Impurities - Lithium (Li) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Magnesium (Mg) $\leq 20 \text{ ppb}$ $< 1 \text{ ppb}$ Trace Impurities - Magnese (Mn) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$	Trace Impurities – Germanium (Ge)	≤ 20 ppb	
Heavy Metals (as Pb) $\leq 100 \text{ ppb}$ $< 50 \text{ ppb}$ Trace Impurities - Iron (Fe) $\leq 40.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Lead (Pb) $\leq 20.0 \text{ ppb}$ $< 10.0 \text{ ppb}$ Trace Impurities - Lithium (Li) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Magnesium (Mg) $\leq 20 \text{ ppb}$ $< 1 \text{ ppb}$ Trace Impurities - Magnese (Mn) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$	Trace Impurities - Gold (Au)	≤ 20 ppb	
Trace Impurities - Iron (Fe) $\leq 40.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Lead (Pb) $\leq 20.0 \text{ ppb}$ $< 10.0 \text{ ppb}$ Trace Impurities - Lithium (Li) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Magnesium (Mg) $\leq 20 \text{ ppb}$ $< 1 \text{ ppb}$ Trace Impurities - Maganese (Mn) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Maganese (Mn) $\leq 20.0 \text{ ppb}$ $< 1.0 \text{ ppb}$	Heavy Metals (as Pb)	≤ 100 ppb	
Trace Impurities – Lead (Pb) $\leq 20.0 \text{ ppb}$ $< 10.0 \text{ ppb}$ Trace Impurities – Lithium (Li) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities – Magnesium (Mg) $\leq 20 \text{ ppb}$ $< 1 \text{ ppb}$ Trace Impurities – Manganese (Mn) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities – Minganese (Mn) $\leq 20.0 \text{ ppb}$ $< 1.0 \text{ ppb}$	Trace Impurities – Iron (Fe)	≤ 40.0 ppb	
Trace Impurities – Lithium (Li) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities – Magnesium (Mg) $\leq 20 \text{ ppb}$ $< 1 \text{ ppb}$ Trace Impurities – Manganese (Mn) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities – Nickel (Ni) $\geq 0.0 \text{ ppb}$ $< 1.0 \text{ ppb}$	Trace Impurities - Lead (Pb)	≤ 20.0 ppb	
Trace Impurities - Magnesium (Mg)≤ 20 ppb< 1 ppbTrace Impurities - Manganese (Mn)≤ 10.0 ppb< 1.0 ppb	Trace Impurities – Lithium (Li)	≤ 10.0 ppb	
Trace Impurities - Manganese (Mn) $\leq 10.0 \text{ ppb}$ $< 1.0 \text{ ppb}$ Trace Impurities - Nickel (Ni)	Trace Impurities – Magnesium (Mg)	≤ 20 ppb	
Trace Impurities - Nickel (Ni)	Trace Impurities – Manganese (Mn)	≤ 10.0 ppb	
	Trace Impurities - Nickel (Ni)		< 5.0 ppb

>>> Continued on page 2 >>>

For questions on this Certificate of Analysis please contact Technical Services at 855 282 6867 or +1 610 386 1700





Material No.: 9606-03 Batch No.: 24B1362001

Test	Specification	Result
Trace Impurities – Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities – Potassium (K)	≤ 50 ppb	< 10 ppb
Trace Impurities – Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities – Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities – Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities – Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities – Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 µm and greater	≤ 60 par/ml	3 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	1 par/ml

Nitric Acid 69% CMOS





Material No.: 9606-03 Batch No.: 24B1362001

Test			-
Test	Specification	Decult	
	Specification	Result	

For Microelectronic Use

Country of Origin: USA Packaging Site: Phillipsburg Mfg Ctr & DC

Kennet, leel

Ken Koehnlein Sr. Manager, Quality Assurance

1 010

1 2 4 4

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Part# 57003 Lot # 062124	 * The certified value is the concentration calculated from gravimetric and volumer * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and 1 the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravinetrically using balances that are calibrated with w * Standards are certified (+/) 0.5% of the stated value, unless otherwise stated. * All Standards should be stored with caps tight and under appropriate iaboratory * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating of Measurement Result," NIST Technical Note 1297, U.S. Government Printing Off 	Homogeneity: No heterogeneity was observed in the preparation of this standard.	Physical Characterization:	Al 40.02 Cit 40.02 Dr 40.02 Hd 3b 40.02 Cit 40.02 Ein 40.02 Hd As 40.2 Cit 40.02 Ein 40.02 In Ba 40.02 Cit 40.02 Gd 40.02 In Ba 40.02 Cit 40.02 Ge 40.02 In Ba 40.02 Cit 40.02 Ge 40.02 Ia		Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	Absolute Standards, Inc. 800-368-1131 www.absolutiestandards.com
2 01 2	 * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standard. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All Standards broud by stoud with cases tight and under appropriate laboratory conditions. * All Standards are prepared with cases tight and under appropriate laboratory conditions. * Mucertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). 	this standard.		40/02 Li T Nh 40/02 Hr 40/02 And 40/02 Li An	-MS (µg/mL)	Mass Spectrometry (ICP-MS):	Certified Reference Material CRM
Printed: 6/24/2024, 11:20:08 PM	Ъ.	Sur P. S.	Certified by:	Site Gall Tite Gall U Gall Site Gall Site Gall U Gall Gall Site Gall Gall <thgall< th=""> <thgall< th=""> Gall<td></td><td></td><td>ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com</td></thgall<></thgall<>			ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

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ក⁰⁸ = ក្រុងអាស់ ដែល ភ្លេង ភ្ល

Z = 1000BL = $\sup_{x \in \mathcal{A}} (\pi_x) = O_{CRM/RM} = k \left(u^2_{Char} + u^2_{T}_{bb} + u^2_{T}_{bb} + u^2_{T}_{bb} + u^2_{Cb} \right)^{1/2}$ $\mathsf{M}^{i} = (1/\mathsf{n}^{\mathsf{clust}\,i})^{\Sigma} \setminus (\Sigma(1/(\mathsf{n}^{\mathsf{clust}\,i})_{\Sigma})$

nieneity standard uncertain ucherts mort arone enti = a fanta lisnegomort ettod, of ettod = dd^u adnere vitidats mot gnot = _{ad}t $\label{eq:spinor} \min \left\{ x \right\} = U_{CRM/RM} = k \left\{ u^2_{char} * u^2_{bb} + u^2_{bb} + u^2_{bb} + u^2_{bb} \right\}^{4}$

$$\begin{split} \chi_{CRM,FRM} = & (\chi_{o}) \; (u_{char, o}) \\ \chi_{a} = mean of Assay Method A with ut and a charter of the standard uncertainty of uncertainty of the standard uncertainty$$

Certified Value, X_{CRM/RM}, where one method of characterization is used is the mean of individual results:

Certified Value, X_{CRMMM}, where two or more methods of characterization are used is the weighted mean of the results: Characterization of CRM/RM by One Method Characterization of CRM/RM by Two or More Methods

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent to following equations are used in the calculate/K=2.

traceability. - The Calculated Value is a value calculated from the weight of a starting material that has been cartified idrectly vs. A National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance starting.

ICP Assay NIST SRM 3162a Lot Number: 130925 1002 ± 4 hg/mL

Pssay Method #1

g = Jojoej

un pepuedra w

(1x) (1w) = X(wi) (xi)

:noiternotnl ysseA

1.012 g/mL (measured at 20 ± 4 °C) Density: 1002 ± 5 µg/mL sulsV beitified

 $\chi_q = mean of Assay Method I with standard uncertainty updat 1$ w₁ = the weighting factors for each method calculated using the tothe weighting actions for each method with the standard uncertainty updat 1

CERTIFIED VALUES AND UNCERTAINTIES 3.0

Starting Material Purity: 99.9975% Starting Material Lot#: 2094 Starting Material: In Metal unineti T 1 000 hg/mL ea: :(s)ətytenA \ əulsV :xinteM

tr. HF 2% (v/v) HNO3 27991717-2T Lot Number: **LITED** Catalog Number: Product Code:

Single Analyte Custom Grade Solution

PRODUCT DESCRIPTION 0.S

Number QSR-1034).

the Competence of Reference Material Producers" and ISO/IEC 17025, "Ceneral Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Vantures is also an ISO 9001 registered manufacturer (QSR Certificate Inorganic Manuel 2014) INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for



ACCREDITATION / REGISTRATION 0.r

300 Technology Drive Christiansburg, VA 24073 USA Christiansburg, VA 24073

R:2/22/24

info@inorganicventures.com E: 240-282-3015 E: 240-282-3030

Refine your results. Redefine your industry. Certificate of Analysis 6657 'SLEST

4.0 TRACEABILITY TO NIST

sbecueq. - This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRMRM uncertainty error and the measurement, weighing and volume dilutiton errors. In rare cases where no NIST SRMRM are available, the term "in-house std.' is a provided.

4.1 Thermometer Calibration

laboratory. - All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration

4.2 Balance Calibration

used for testing are annually compared to master weights and are traceable to NIST. - All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

.my €.0 a2 M 0732£0.0 > ⊨N O 832000.0 > ⊔∃ M 8€2000.0 > ⊵A M ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to CRMRMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS, were analyzed in an up of the method for each element of the property effection of the method for the met

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			9	0:000536	>	٩٨	Μ	0.004900	>	эS	0	¢77000.0		oM	Μ	892000.0	>	ΞL	Μ
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			8	0.000268	>	Π	Μ	0.000268	>	ЧЫ	Μ	0.027225	>	П	0	297000.0		CL	M
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			5	0.000268	>	Ш	Μ	0.000268	>	ЧЯ	Μ	271100.0		К	W	0.000268	>	9 <u>0</u>	W
					>	Ш	S	0.000536	>	Ъł	Μ	692000.0	>	4	Μ	892000.0	>	PO	M
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				92000.0	>	ЧT	Μ	£70100.0	>	ЬΡ	Μ	0.003231	>	бн	Μ	0.005366	>	вe	M
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M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

- For the calibration of analytical instruments and validation of analytical methods as appropriate. 9.0 INTENDED USE

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

Page 2 of 4

Page 3 of 4

- Chemical Testing - Accredited / A2LA Certificate Number 883.01 "serveter of the second second and the Competence of the Competence of Testing and Calibration Laboratories."

- QSR Certificate Number QSR-1034

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0.01

Homogeneity data indicate that the end user should take a minimum server of 0.2 m L or 2.0 m L or 2 - This solution was more according to the superior superior of the form as the solution of the homogeneous. المستحدم المرابعة الم .viienegeneity.

Please refer to the Safety Data Sheet for information regarding this CRMRM. HOMOGENEITY 0'6

NOITAMAORNI SUOGAASAH 0.8

1401150180, 14011702, 36Ar12C, 48Cs, 196X≃2 (Where X = Zr, Mo, Fu) Ωb, Ta, Cr, U	.sselo n r r r	0.0054 / 0.00052 µg/mL 0.0054 / 0.00038 µg/mL 0.0053 / 0.00034 µg/mL 10 not be prepared or stored if 10N	CP-OES 323.452 nm (CP-OES 334.941 nm (CP-OES 334.941 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm) (CP-OES 34.121 nm) (CP-OES 34.121 nm) (CP-OES 34.121 nm) (CP-OES 34.121 nm)
SET Interferences (underlined indicates severe) 32S160, 32S14N,	Orde A/N	14 pt	ICP-MS 48 amu

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view): **Technique/Line**

1:1:1 H2O / HF / H2SO4 or fuse ash with pyrosultate it oxide is as plastic pigment and likely in prookite Notentity: Oxde - low temperature history and sortanty - ineer (sortant in 122) in source heads Notentity: Oxde - low temperature history (-800EC) brookite (fuse in Pto with KS2207); Ores (f TI Containing Samples (Preparation and Solution) - Metal (Soluble in H2O / HF caution -powder reacts violentino: Ovide , Iour Inergene , or entile (Discoluted by Inergene) and Ferdinal Market (Soluble In 1997).

HINGS / LOPE corporations of an LOPE contained, while all solutions as the TI(F)6-2 chemically stable for years in HNOS / Lope container. 1-10,000 ppm single element solutions as the TI(F)6-2 chemically stable for years in TI Containing American and Solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. with a fendency to hydrolyze forming the hydrafied oxide in all dilute acids except HF. **Stability -** 2-100 ppb levels stable (Alone or mixed with all other metals) as the Ti(F)6-2 for months in 1% HNO3 / LDPE container. 1-10.000 point and element solutions as the Ti(F)6-2 chemically stable for year media. Unstable at ppm levels with metals that would pull F- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of thansition elements unless they are fluorinated). Stable with more inorganic anions with a tendency to hydrolyze forming the hydrafed oxide in all dilute acids except HF. Chemical Compatibility - Soluble in concentrated HCI, HF, H3PO4 H2SO4 and HVO3. Avoid neutral to basic S-8(T)T 6 4+ 78.74 - noiluite in Solution (Chemical Form in Solution - 47.74 6 T(F)6-5-- For more information, visit www.inorganicventures.com/TCT Afomic Weinher Valence: Coordination Winnher: Chemical Equa

reported density. Do not pipette from the container. Do not return removed aliquots to container. - After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the renorted density. To not other from the container. To not return removed alternots to container.

Page some more served to the served to the served to the ordent of the ordent increase in the analyte concentration (s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being the rescaled to the test to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss. - While stored in the sealed TCT bag, transpiration of this CRAWRM is negligible. After opening the sealed TCT had transmission of the CDMMAN will occur recutification increase in the source concentration of the is

- Store between approximately 4° - 30° C while in sealed TCT bag.

Page 4 of 4

Certifying Officer:

Chairman / Senior Technical Director

NOS Paulo 182

Paul Gaines

-

Thomas Kozikowski Manager, Quality Control

Certificate Approved By:

0.2r

NAMES AND SIGNATURES OF CERTIFYING OFFICERS

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7,1.

- Sealed TCT Bag Open Date:

11.3 Period of Validity stability studies conducted on property stored and handled CR/WRMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

- The lot expiration date reflects the period of time that the stability of a CRMMM can be supported by long term

- The date after which this CRM/RM should not be used.

- June 17, 2027

11.2 Lot Expiration Date

The cartification is valid within the measurement uncertainty specified provided the CRWRM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

June 17, 2022

11.1 Certification Issue Date

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY 0.11

norganic Ventures, 300 Technicky Drive, Christianeurg, Ve. 24073, USA; Telephone: 800,669,678; 540,585,3030, Fax: 540,562,5015; Innga

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

ADSOIUTE STANDARDS, INC. 800-368-1131 www.absolutestandards.com			U	ertified I	Referen	ce Mate	Certified Reference Material CRM	C	1117		•	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	ANAB ISO 17034 Accredited AR-1539 Certificate Number ttps://Absolutestandards.com	ccredited Number ards.com
הבמדובובה אובותווד מרמסמד.							4		20	2				
CENTIFIED WEIGHT NET ON	<u>57038</u> 031524			Solvent:		24002546	Nitric Acid				1			
Description:	Strontium (Sr)	(Sr)			700		Nitrio Acid		Comulated Bur	N Dr.	Boncon Chan	to manual state	031504	
Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):	031527 Ambient (20 °C) 1000	ŝ					Nume Acid			apy.	Denson crian	La	120100	
NIST Test Number:	6UTB		5E-05 B	5E-05 Balance Uncertainty	uinty				Reviewed By:	By:	Pedro L. Rentas	as	031524	
Weight shown below was diluted to (mL): Lot Compound RM# Number	Is diluted to (mL): Lot RM# Number	2000.07 Nominal Conc. (µg/mL)	0.100 Purity (%)	0.100 Flask Uncertainty Purity Uncertainty Assay (%) Purity (%) (%)	say ()	Target Weight (g) V	Actual Weight (g) C	Actual Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	CAS	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LDS	SDS Information Safety Info. On Attachee SHA PEL (TWA)	d pg.) LDSO	NIST SRM
1. Strontium nitrate (Sr)	IN017 SRZ022018A1	1000	68.997	0.10	41.2 4.8	4.85470	4.85502	1000.1	2.0	10042-76-9	NA	orl-ra	ori-rat >2000mg/kg 3153a	3153a
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Absolute Standards, Inc. www.absolutestandards.com 800-368-1131



Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

							Trace M	letals	Verification	ation	by ICP-MS		(ng/mL)						
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Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

Sur ?

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in

the preparation of all standards.

All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

- E. 5 * 1982 246 146 **4**• . 12 M 8: 2 1.481¥ *:

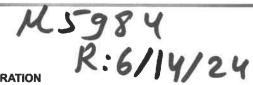
-3



Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com



P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGY10
Lot Number:	V2-Y740548
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Yttrium
Starting Material:	Yttrium Oxide
Starting Material Lot#:	2661 and 06230520YL
Starting Material Purity:	99.9984%
CERTIFIED VALUES	

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:	10000 ± 30 μg/mL
Density:	1.032 g/mL (measured at 20 \pm 4 °C)

Assay Information:

Assay Method #1	10011 ± 25 μg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	9997 ± 50 μg/mL ICP Assay NIST SRM 3167a Lot Number: 190730
Assay Method #3	9984 ± 31 µg/mL

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

Calculated NIST SRM Lot Number: See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, X_{CRWRM}, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i) (X_i)$

- XI = mean of Assay Method i with standard uncertainty uchar i
- w_i = the weighting factors for each method calculated using the inverse square of the variance:
 - $w_i = (1/u_{char})^2 / (\Sigma (1/(u_{char})^2))$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{\frac{1}{2}}$

- k = coverage factor = 2
- $u_{char} = [\Sigma((w_i)^2 (u_{char} i)^2)]^{1/2}$ where $u_{char} i$ are the errors from each characterization method
- u_{bb} = bottle to bottle homogeneity standard uncertainty u_{its} = long term stability standard uncertainty (storage)
- uts = transport stability standard uncertainty (stor
- als assister subsity surraise atternal

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

 $X_{CRM/RM} = (X_a) (u_{char a})$ $X_a = mean of Assay Method A with$ $<math>u_{char a} = the standard uncertainty of characterization Method A$

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k ($u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{ts}$)^{1/2} k = coverage factor = 2 u_{char a} = the errors from characterization u_{bb} = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{lts} = transport stability standard uncertainty

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

 All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

М	Ag	<	0.004600	М	Eu		0.009037	М	Na		0.086360	М	Se	<	0.005200	М	Zn		0.030125
М	A		0.014862	0	Fe		0.002410	М	Nb	<	0.000570	ο	Si		0.024100	0	Zr	<	0.002600
М	As	<	0.003500	м	Ga	<	0.000570	м	Nd		0.000923	М	Sm		0.000461				
М	Au	<	0.001700	м	Gd	<	0.003500	М	Ni	<	0.005700	М	Sn	<	0.002300				
0	в		0.002209	м	Ge	<	0.005200	М	Os	<	0.001200	М	Sr	<	0.004600				
0	Ва	<	0.002500	М	Hf	<	0.000570	n	Р	<		М	Та	<	0.000570				
0	Be	<	0.001400	М	Hg	<	0.000570	М	Pb		0.005020	М	Tb		0.001044				
М	Bi	<	0.003500	М	Но		0.009037	М	Pd	<	0.005100	М	Те	<	0.002300				
0	Ca		0.009841	Μ	In	<	0.002300	М	Pr	<	0.002300	М	Th	<	0.000570				
М	Cd	<	0.000570	М	Ir	<	0.000570	М	Pt	<	0.000570	М	Ti	<	0.003500				
М	Се	<	0.002300	0	к		0.018677	м	Rb	<	0.000570	М	TI	<	0.000570				
М	Со	<	0.000570	М	La		0.000461	М	Re	<	0.000570	М	Tm	<	0.003500				
М	Cr	<	0.004000	0	Li	<	0.009300	М	Rh	<	0.008000	М	U	<	0.000570				
М	Cs	<	0.000570	М	Lu		0.000582	М	Ru	<	0.000570	М	V		0.001265				
М	Cu		0.002610	0	Mg		0.001486	n	S	<		М	W	<	0.002300				
М	Dy		0.003815	М	Mn		0.000582	М	Sb		0.005422	s	Y	<					
М	Er		0.003615	М	Мо	<	0.005700	М	Sc	<	0.001200	м	Yb		0.001827				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

6.1 This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures <u>Terms and Conditions of Sale</u>. <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between $4^\circ - 24^\circ$ C to minimize the effects of transpiration. Use at $20^\circ \pm 4^\circ$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 88.91 +3 6 Y(OH)(H2O)x+2 Chemical Compatibility -Soluble in HCl, H2SO4 and HNO3. Avoid HF, H3PO4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H2O/ HNO3); Ores (Carbonate fusion in Pt0 followed by HCI dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H2O / HCI or HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 89 amu	0.8 ppt	N/A	73Ge16O, 178Hf+2
ICP-OES 360.073 nm	0.005 / 0.000036 µg/mL	1	Ce, Th
ICP-OES 371.030 nm	0.004 / 0.00007 µg/mL	1	Се
ICP-OES 377.433 nm	0.005 / 0.0009 µg/mL	1	Ta, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 20, 2024

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- February 20, 2029
- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS **Certificate Prepared By:**

Uyen Truong **Custom Processing Supervisor**

Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

Mayn menny Mayyni Kh Paul R Laina

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



1 of 1



Nitric Acid 69%

CMOS DECN, 1. - OSIO14025 DECN, 1. - OSIO14025 DECN, 1. - OSIO14025 M6034, M6034 M6034, M6034 M6035, M6038, M6036, 1. - Certificate of Analysis





Material No.: 9606-03 Batch No.: 24D1062002 Manufactured Date: 2024-03-26 Retest Date: 2029-03-25 **Revision No.: 0**

Test	Specification	Result
Assay (HNO3)	69.0 - 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO4)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities – Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities ~ Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	2.3 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	100 ppb
Trace Impurities – Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities – Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Гrace Impurities – Manganese (Мп)	≤ 10.0 ppb	< 1.0 ppb
Frace Impurities – Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb





Material No.: 9606-03 Batch No.: 24D1062002

Test	Specification	Result
Trace Impurities – Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities – Potassium (K)	≤ 50 ppb	16 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities – Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities – Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities – Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 μm and greater	≤ 60 par/ml	10 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	3 par/ml

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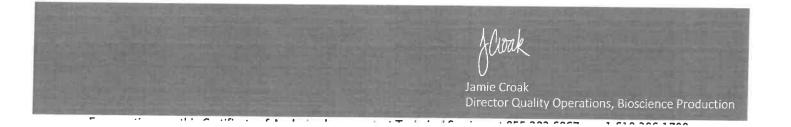




Material No.: 9606-03 Batch No.: 24D1062002

Test	Specification	Result	

For Microelectronic Use



Nitric Acid 69%

CMOS DECN, 1. - OSIO14025 DECN, 1. - OSIO14025 DECN, 1. - OSIO14025 M6034, M6034 M6034, M6034 M6035, M6038, M6036, 1. - Certificate of Analysis





Material No.: 9606-03 Batch No.: 24D1062002 Manufactured Date: 2024-03-26 Retest Date: 2029-03-25 **Revision No.: 0**

Test	Specification	Result
Assay (HNO3)	69.0 - 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO4)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities – Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities ~ Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	2.3 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	100 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities – Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Гrace Impurities – Manganese (Мп)	≤ 10.0 ppb	< 1.0 ppb
Frace Impurities – Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb





Material No.: 9606-03 Batch No.: 24D1062002

Test	Specification	Result
Trace Impurities – Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities – Potassium (K)	≤ 50 ppb	16 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities – Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities – Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities – Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 μm and greater	≤ 60 par/ml	10 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	3 par/ml

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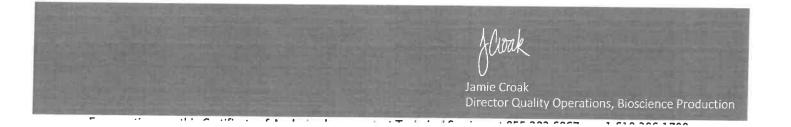




Material No.: 9606-03 Batch No.: 24D1062002

Test	Specification	Result	

For Microelectronic Use







Material No.: 9530-33 Batch No.: 24D1562005 Manufactured Date: 2024-03-18 Retest Date: 2029-03-17 Revision No.: 0

Merenvez - 08/01/2024 Pater m 6039 m 6039 Certificate of Analysis

Test	Specification	Result
ACS – Assay (as HCI) (by acid-base titrn)	36.5 - 38.0 %	37.6 %
ACS – Color (APHA)	≤ 1 0	5
ACS - Residue after Ignition	≤ 3 ppm	< 1 mgg 1 >
ACS - Specific Gravity at 60°/60°F	1.185 - 1.192	1.192
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS Free Chlorine (as Cl2)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO4)	≤ 0.05 ppm	0.03 ppm
Sulfate (SO4)	≤ 0.5 ppm	< 0.3 ppm
Sulfite (SO3)	≤ 0.8 ppm	0.3 ppm
Ammonium (NH4)	≤ 3 ppm	< 1 ppm
Trace Impurities ~ Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (Al)	≤ 10.0 ppb	< 5.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 3.0 ppb
Trace Impurities ~ Barium (Ba)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 10.0 ppb
Trace Impurities ~ Boron (B)	≤ 20.0 ppb	2.2 ppb
Trace Impurities – Cadmium (Cd)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	31.0 ppb
Trace Impurities - Chromium (Cr)	≤ 1.0 ppb	0.5 ppb
Trace Impurities - Cobalt (Co)	≤ 1.0 ppb	0.2 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Trace Impurities – Gold (Au)	≤ 4.0 ppb	< 0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 15 ppb	3 ppb

>>> Continued on page 2 >>>





Material No.: 9530-33 Batch No.: 24D1562005

Test	Specification	Result
Trace Impurities - Lead (Pb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Lithium (Li)	\leq 1.0 ppb	< 0.1 ppb
Trace Impurities – Magnesium (Mg)	≤ 10.0 ppb	2.2 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities – Molybdenum (Mo)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Nickel (Ni)	≤ 4.0 ppb	0.2 ppb
Trace Impurities – Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	≤ 9.0 ppb	< 1.0 ppb
Trace Impurities – Selenium (Se), For Information Only		< 1.0 ppb
Trace Impurities – Silicon (Si)	≤ 100.0 ppb	< 10.0 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	≤ 100.0 ppb	2.0 ppb
Trace Impurities - Strontium (Sr)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Tantalum (Ta)	≤ 1.0 ppb	< 0.9 ppb
Trace Impurities – Thallium (TI)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Tin (Sn)	≤ 5.0 ppb	< 0.4 ppb
Trace Impurities – Titanium (Ti)	≤ 1.0 ppb	0.2 ppb
Trace Impurities - Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	< 0.2 ppb
Trace Impurities – Zirconium (Zr)	≤ 1.0 ppb	< 0.1 ppb

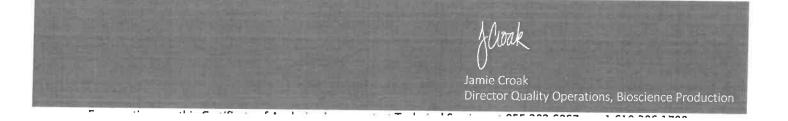




Material No.: 9530-33 Batch No.: 24D1562005

Test	Specification	Result	
	specification	Result	

For Laboratory,Research,or Manufacturing Use Product Information (not specifications): Appearance (clear, fuming liquid) Meets ACS Specifications Storage Condition: Store below 25 °C.







R: 9/10/24

Material No.: 9606-03 Batch No.: 24D1062002 Manufactured Date: 2024-03-26 Retest Date: 2029-03-25 Revision No.: 0

Certificate of Analysis

	M6088, M6089 M6090, M6	091 M6092, M6093
Test	Specification	
Assay (HNO3)	69.0 - 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO4)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities – Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	2.3 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	100 ppb
Trace Impurities – Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities – Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

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For questions on this Certificate of Analysis please contact Technical Services at 855 282 6867 or +1 610 386 1700





Material No.: 9606-03 Batch No.: 24D1062002

Test	Specification	Result
Trace Impurities – Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities – Potassium (K)	≤ 50 ppb	16 ppb
Trace Impurities – Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities – Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities – Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities – Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count – 0.5 µm and greater	≤ 60 par/ml	10 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	3 par/ml

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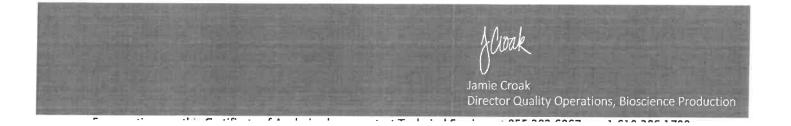




Material No.: 9606-03 Batch No.: 24D1062002

Test Specifica	ation Result	
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For Microelectronic Use







R: 9/10/24

Material No.: 9606-03 Batch No.: 24D1062002 Manufactured Date: 2024-03-26 Retest Date: 2029-03-25 Revision No.: 0

Certificate of Analysis

	M6088, M6089 M6090, M6	091 M6092, M6093
Test	Specification	
Assay (HNO3)	69.0 - 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO4)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities – Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	2.3 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	100 ppb
Trace Impurities – Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities – Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

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For questions on this Certificate of Analysis please contact Technical Services at 855 282 6867 or +1 610 386 1700





Material No.: 9606-03 Batch No.: 24D1062002

Test	Specification	Result
Trace Impurities – Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities – Potassium (K)	≤ 50 ppb	16 ppb
Trace Impurities – Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities – Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities – Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities – Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count – 0.5 µm and greater	≤ 60 par/ml	10 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	3 par/ml

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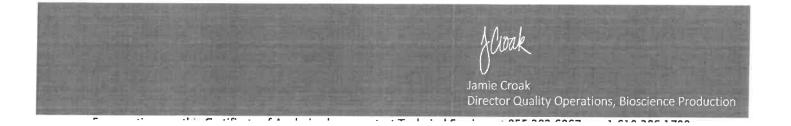




Material No.: 9606-03 Batch No.: 24D1062002

Test Specifica	ation Result	
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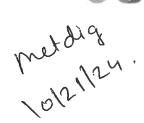
For Microelectronic Use











Material No.: 9530-33 Batch No.: 24D1562005 Manufactured Date: 2024-03-18 Retest Date: 2029-03-17 Revision No.: 0

Certificate of Analysis

Test	Specification	Result
ACS – Assay (as HCl) (by acid-base titrn)	36.5 - 38.0 %	37.6 %
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS - Specific Gravity at 60°/60°F	1.185 - 1.192	1.192
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS – Free Chlorine (as Cl2)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO4)	≤ 0.05 ppm	0.03 ppm
Sulfate (SO4)	≤ 0.5 ppm	< 0.3 ppm
Sulfite (SO3)	≤ 0.8 ppm	0.3 ppm
Ammonium (NH4)	≤ 3 ppm	< 1 ppm
Trace Impurities – Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities - Aluminum (AI)	≤ 10.0 ppb	< 5.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 3.0 ppb
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 10.0 ppb
Trace Impurities – Boron (B)	≤ 20.0 ppb	2.2 ppb
Trace Impurities – Cadmium (Cd)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	31.0 ppb
Trace Impurities – Chromium (Cr)	≤ 1.0 ppb	0.5 ppb
Trace Impurities – Cobalt (Co)	≤ 1.0 ppb	0.2 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Trace Impurities - Gold (Au)	≤ 4.0 ppb	< 0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	3 ppb

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Material No.: 9530-33 Batch No.: 24D1562005

Test	Specification	Result
Trace Impurities - Lead (Pb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Lithium (Li)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Magnesium (Mg)	≤ 10.0 ppb	2.2 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities – Molybdenum (Mo)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Nickel (Ni)	\leq 4.0 ppb	0.2 ppb
Trace Impurities – Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	≤ 9.0 ppb	< 1.0 ppb
Trace Impurities - Selenium (Se), For Information Only		< 1.0 ppb
Trace Impurities – Silicon (Si)	≤ 100.0 ppb	< 10.0 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	\leq 100.0 ppb	2.0 ppb
Trace Impurities – Strontium (Sr)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Tantalum (Ta)	\leq 1.0 ppb	< 0.9 ppb
Trace Impurities - Thallium (TI)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Tin (Sn)	≤ 5.0 ppb	< 0.4 ppb
Trace Impurities – Titanium (Ti)	\leq 1.0 ppb	0.2 ppb
Trace Impurities - Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	\leq 5.0 ppb	< 0.2 ppb
Trace Impurities – Zirconium (Zr)	≤ 1.0 ppb	< 0.1 ppb

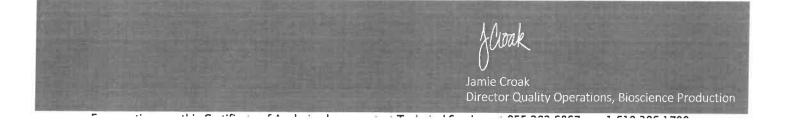




Material No.: 9530-33 Batch No.: 24D1562005

Test	Specification	Result	
	-		

For Laboratory, Research, or Manufacturing Use Product Information (not specifications): Appearance (clear, fuming liquid) Meets ACS Specifications Storage Condition: Store below 25 °C.







Material No.: 9606-03 Batch No.: 24D1062002 Manufactured Date: 2024-03-26 Retest Date: 2029-03-25 **Revision No.: 0**

Test		Specification	Result
Assay (HNO₃)		69.0 - 70.0 %	69.7 %
Appearance		Passes Test	Passes Test
Color (APHA)		≤ 10	5
Residue after Ig	nition	≤ 2 ppm	1 ppm
Chloride (Cl)		≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO4)		≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO4)		≤ 0.2 ppm	< 0.2 ppm
Trace Impurities	- Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Ant	imony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities	– Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities	– Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities	– Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities	– Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities	- Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities	– Calcium (Ca)	≤ 50.0 ppb	2.3 ppb
Trace Impurities	– Chromium (Cr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities	– Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities	– Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities	– Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities	- Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities	– Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as	Pb)	≤ 100 ppb	100 ppb
Trace Impurities	- Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities	- Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities -	- Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities -	- Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities -	- Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities -	- Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

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For questions on this Certificate of Analysis please contact Technical Services at 855 282 6867 or +1 610 386 1700





Material No.: 9606-03 Batch No.: 24D1062002

Test	Specification	Result
Trace Impurities – Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities – Potassium (K)	≤ 50 ppb	16 ppb
Trace Impurities – Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities – Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities – Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities – Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities – Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities – Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count – 0.5 µm and greater	≤ 60 par/ml	10 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	3 par/ml

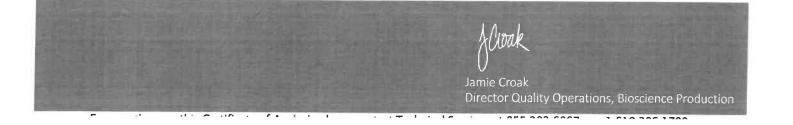




Material No.: 9606-03 Batch No.: 24D1062002

Test	Specification	Result

For Microelectronic Use



_				/			1. Sodium nitrate (Na)	Compound	Description: Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	CERTIFIED WEIGHT REPORT: Part Numbei Lot Numbei	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
m/z->	N 0 11 0	m/z-≻ 5.0E6	N.5 6	m/z-> 5.0∈6	2.5E5	5.0E5	trate (Na)	đ	Description: Sodium (Expiration Date: 12226 Recommended Storage: Ambient (2 I Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was dliuted to (mL):	<u>VEIGHT RE</u> Part I Lot I	standards.c
						[1] Spec	=		Description: Expiration Date: nended Storage: ntration (µg/mL): htration (µg/mL): T Test Number: ST Test Number:	HT REPORT: Part Number: Lot Number:	om
0		110		10		[1] Spectrum No.1	IN036 NAV01201511	Lot RM# Number	Sodiur 12226 Ambien 10000 6UTB 6UTB	<u>58111</u> 122223	
N N O		120		N. O		-				23	V
230		130		а О			10000 99.999	Nominal Purity Conc. (µg/mL) (%)	5) 3000.4 0.06		RIO
		and here and				8.935 sec]:58111.D# [Count] [Linear]	999 0.10	ity Uncertainty) Purity (%)	2% 5E-05 Balance Uncertainty 0.06 Flask Uncertainty		Certi
240		140		6		.D# [Cot	26.9	Assay (%)	2% ncertainty ertainty	Solvent:	ified Refu
N U O		150		Ö		unt) [Line	111.5406	Target Weight (g)	60.0 (mL)	Lot # 24002546	erence Mi MSR 0
280		160		0 O		ar]	111.5479	Actual Weight (g)	Nitric Acid	Nitric Acid	Certified Reference Material CRM 5 124 MSR06 MS
				N			10000.7	Actual Conc. (µg/mL)		3	RM 5807
		170		70			20.0	Expanded Uncertainty +/- (µg/mL)	Formulated By:	Allea	
		180		80			7631-99-4	0	By:	aha	
		190		80			5 mg/m3	SUS information (Solvent Safety Info. On Attached pg.) AS# OSHA PEL (TWA) LD50	Aleah O'Brady	Brad	×
		200		100				SUS Information afety Info. On Atta DSHA PEL (TWA)	ady C	All I	ANAB AR-1 https:///
		ŏ		ŏ			orl-rat 3430 mg/kg	ached pg.) سەءە	122223		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
							9/kg 3152a	NIST	223		4 Accred cate Num andards.c

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Printed: 12/29/2023 2:56:20 PM	Printed: 12/2					2 of 2							2223	Lot # 122223		# 58111	Part #
	r sed in	The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).	nts unless oth ity raw materi e to NIST (see the Uncertaint , D.C. (1994).	ements purity ; eable to ing the gton, D.	The certified value is the concentration calculated from gravimetric and volumetric measureme Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest puri the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with weights traceable Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing t Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington,	and the and the ith weig ated. atory co atory co flice,	The certified value is the concentration calculated from gravimetric and volume Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with w Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating a Measurement Result," NIST Technical Note 1297, U.S. Government Printing Offi	avimetri ass A g are cali are cali ppropria ernmen	from gra rated Cl ior to us ces that lue, unle under a J.S. Gov	ulated er, calib er, calib er, calib er, calib g baland g baland g baland ght and ght and 1297, L	tion calc zed wat ally usin ally usin of the st and Ku al Note	ncentra ards. meticule 0.5% c 0.5% c lor, B.N Technic	The certified value is the concentration calculated from gravi Purified acids, 18.2 megohm deionized water, calibrated Clas the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that ar Standards are certifed (+/-) 0.5% of the stated value, unless All Standards should be stored with caps tight and under app Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin Measurement Result," NIST Technical Note 1297, U.S. Gover	value i s, 18.2 ion of e prepa e certifi e certifi Referen it Result	certified preparat preparat dards ar dards ar dards ar tandards suremen	* The * Purif * All s * Stan Mea:	
Certified by:	e e							standard.	on of this	reparati	ed in the j	ts observ	Physical Characterization: Homogeneity: No heterogeneity was observed in the preparation of this standard.	o heterog	Physical Characterization: Homogeneity: No heterogeneity v	Physi Homog	
	-				alyte	(T) = Target analyte	= (T)										
2 2 × 3 < c *	40.02 40.02 17 40.02 17 17 17 17 17 17 17 17 17 17	Ta Sr			402 402 402 402 402 402 402 402 402 402	P P OS NN		Man Lu Mag	4 4 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5	양 다 다 타 H H	4 4 4 4 4 4 5 8 8 8 8 8 8	e e e e e e e	40.02 40.02 40.02 40.02	5 S C C S S S	40.02 40.02 40.02 40.02	Bi Bi	
			(ua/ml)	ומ	rometry (ICP-MS): Verification by ICP-M	ry (ICP		ass Spect Metals	asma Ma Trace	pled Pla	aly Cou	ductiv	sis by In	Analys	umenta	Instra	
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	*			al CRM	Certified Reference Material C	ference	tified Re	Cen					s, Inc.	ards.con	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	Absolute (800-368-1131 www.absolute	800 WWW

	1.057	2.0年7	m/z->	р. С. С. С.	5.0 E	7/2->	N 0 0	5.0E5	1. Antimony (Sb)	Compound	Volume shown below was diluted to (mL):	NIST Test Number:	Recommended Storage: Nominal Concentration (µg/mL):	Expiration Date:	Part Number: Lot Number: Description:	CERTIFIED WEIGHT REPORT:	800-368-1131 www.absolutestandards.com
)			110			10		[1] Spectrum No.1	58151	Part Number	lip sam mo	ber	nL):	ate:	on:		
			12.			NO		40.1	1 100923	Lot r Number	uted to (mL)	6UTB	Ambient (20 °C) 1000	120526	57051 120523 Antimony (Sb)		
									0.1000	Dilution Factor	: 3000.41		20 °C)		w (Sb)		Ri
			130			30		39C]:58	300.0	Initial Vol. (mL)		5E-05					Certifi (0 1) 03 (2 4
:			140			\$ 0		051.D#	0.084	Uncertainty) Pipette (mL)		Balance Uncertainty				ł	Certified
			1 80			50		17.964 sec]:58051.D# [Count] [Línear]	1000	Nominal	unty	rteintv		2.0%	24002546	Lot #	Certified Reference Material CRM (芝り MS802 Mら
						Ö		_(near]	10001.4	Initial) Conc. (µg/ml				(mL)	Nitric Acid	Solvent:	nce Material
			180			80			1000.0	Final nL) Conc. (µg/mL)				Nitric Acid			CRM
			170			70			0 2.1	Expanded Uncertainty mL) +/- (µg/mL)		Reviewe	K	id Formulated By:			UU UU
			180			80			7440-36-0	Ĕ	an of		20	ited By:	Ferre		
			190			0				Solvent Sa CAS# OSH/		Pertr	the second	Lawr	and b		V
						A. and A. and A. and A.			0.5 mg/m3	SDS Information nt Safety Info. On Attac OSHA PEL (TWA)		o I Rentas	SA)	Lawrence Barry	De		Alv AR https
			200			100			orl-rat 7000 mg/kg	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50							ANAB ISO 1:/034 Accreated AR-1539 Certificate Number https://Absolutestandards.com
) mg/kg 3102a) NIST	120020	120523		120523			tificate l standar

www.absolutestandards.com 800-368-1131 Absolute Standards, Inc.



Certified Reference Material CRM



https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

							I race M	etals	Verifica	tion	by ICP-N	IS (II)	g/mL)						
A	B	2	202	2	-	1	MILLION CONTRACTOR	Manual	AND IN THE OWNER.			No. of Lot, No.			Contraction of the local division of the loc	CONTRACTO	AL INCOME		
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	5,			1	20.00	CR1	70.02	L	20.02	NP	40.02	Re	40.02	2	40.02	P	20102	9	4000
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B	2020	ç	33	5	5	ľ	3	5,		!		-	mot on	9	TNNE		20.02	~	20.02
1		u g	10.01	ę	70.02	-	20.05	MD	20.02	Pd	40.02	8	40.02	Za	A	þ	40.02	Ş	3
De	1000	ç	40,02	ନ୍ଥ	40,02	4	402	He	A 12	Ð	300	2	33	n'	3	1	3	: :	
<u>H</u>	43	3	3	P	3	4						1111	700.00	ġ	20.02	101	<u.u2< td=""><td>1</td><td>20.02</td></u.u2<>	1	20.02
		1	20.02	G	20.05	5	20.02	Mo	40.02	7	0 02	S	40.02	6	AN 03	3	33	7	3
G	SUUS	ç	A .02	Au		y	A B	K	200	4	5	2	5	3,			10.00	1	70.02
				I					NAL ON	ļ	44	Ŕ	20.02	12	20.02	11	40.02	2	20.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

In P. S.

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

* Purified acids, 18.2 megohm delonized water, calibrated Class A glassware and the highest purity raw materials are used in

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Part # 57051 Lot # 120523

 N.5 M	m/z-> 110 5.0⊑6	ហ ៣ ហ	m/z-> 10	ប ០ ព ព	[1] Spectrum No.1 1.0E7	1. Silver nitrate (Ag)	Compound	CERTIFIED WEIGHT REPORT: Part Number: Part Number: Lot Number: Lot Number: Description: Silver (A Description: Description: Silver (A Description: Description: OPEN: Description: Description: Silver (A Nominal Concentration (µg/mL): NOTB Weight shown below was diluted to (mL):	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
	0 120		N		-	IN035 J0612AGA1 100	Lot Nominal RM# Number Conc. (µg/mL)	57047 122823 Silver (Ag) 122826 Ambient (20) 1000 6UTB 6UTB 6UTB	
	190 140		80 40		14.044 sec]:58147.D# [Count] [Linear]	88.8888 0.10	Nominal Purity Uncertainty Assay nc. (µg/mL) (%) Purity (%) (%)	PC) 5E-05 Balance Uncertainty	Certified I
	150		5 O		[Count] [Linear]		Target Weight (g)	Lot # 29% 80.0 (mL)	Certified Reference Material lろ ヱӋ
	160 170		60 70			1000.0	E Actual Actual Ur Weight (g) Conc. (µg/mL) +/	Nitric Acid	rial CRM M6030
	180		80			2.0 7761-88-8	Expanded Uncertainty (Solver +/- (µg/mL) CAS#		30
	190 200		90 100			10 ug/m3	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD5	Benson Chan Pedro L. Rentas	AN
	0		Ŭ			NA 3151	ched pg.) NIST LD50 SRM	122823	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Part # 57047 Lot # 122823

1 of 2

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Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

							I ACE IVIE	VICLAIS	Venillaria		by ICP-I	NO (hg/mL)						
			The shares	A DECEMBER OF	Contraction in the second	Store and	12 3 2 201	10 10		2 KU 1	With a light of the light	1.12	140 10 10 10 10 10 10 10 10 10 10 10 10 10	No.		No.	and the second		
A	<0.02	Q	<0.02	Dy	<0.02	Hf	<0.02	5	<0.02	N	<0.02	7	<0.02	Se	<0.2	ТЪ	<0.02	W	<0.02
SP	<0.02	Ca	<0.2	막	40.02	Но	<0.02	Lu	<0.02	Ŋ	<0.02	Re	<0.02	<u>[2</u>	<0.02	F	<0.02	d	<0.02
As	<0.2	ç	<0.02	臣	<0.02	In	<0.02	Mg	<0.01	8	<0.02	Rh	<0.02	Å	T	1	<0.02	<	<0.02
Ba	<0.02	S	<0.02	ନ୍ଥ	<0.02	Ħ	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Ţ,	<0.02	YЪ	<0.02
Be	<0.01	Ω	<0.02	ନ୍ମ	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	ş	<0.02	Ta	<0.02	Y	<0.02
Bi	<0.02	S	<0.02	ନ୍ନ	<0.02	La	<0.02	Mo	<0.02	P	<0.02	Sm	<0.02	Ś	<0.02	Sn	<0.02	2	<0.02
6	<0.02	8	40.02	Au	<0.02	РЪ	<0.02	Nd	<0.02	K	<0.2	%	<0.02	Ta	<0.02	Ð	<0.02	2	<0.02

Homogeneity: No heterogeneity was observed in the preparation of this standard.

(T)= Target analyte

Physical Characterization:

Certified by:

In & She

* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

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Absolute standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part N Lot N Desc	Expiration Date: Recommended Storage:	NIST Te	Weight showr	Compound		2.0 円の	1.0巨6	TTVZ->>	1.0巨4	0 0 0	m/z->-	1.0匹6	5.0 E5	mvz->
	<u>PORT:</u> Part Number: Lot Number: Description:	Expiration Date: nended Storage:	NIST Test Number:	Weight shown below was diluted to (mL):	RM#				Ó			110			210
	<u>57081</u> 062724 Thalllum (TI)	062727 Ambient (20 °C)	6UTB	ed to (mL): Lot	Number C	110007 BCCF4088			N			120			220
	3	°C)		2000.1 0 Nominal Pi	Conc. (µg/mL) (88			ක 0			130			230
Certified Refi R ! 8]5]24	ğ			0.10 Flask Uncertainty Purity Uncertainty Assay	(%) Purity (%)	89,889 U.1U			4			140			240
Certified Reference Material CRM とという		2% 40 (m	sertainty	ainty v Assay Target	(%) Weight (g)	0.11			80			150			250
e Material	Lot # 24002546 Nitric Acid	40.0 Nitric Acid (mL)		get Actual		116C'7 CJR									
СRМ М6023	Acid	Acid		Actual	Weight (g) Conc. (µg/mL)	1000.1			8			160			260
23	Ala	Formulated By:	Reviewed By:	Expanded Uncertainty		2.0			70			170			
	20	\$		(Solvent	CAS#	10102-45-1			80			180			
http	Gion El o	Aleah O'Brady	Pedro L. Rentas	SDS Information Safety Info. On Atta	OSHA PEL (TWA)	u.i mg/ma			90			190			
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com		062724	062724	SDS Information (Solvent Safety Info. On Attached pg.)	s) LD50	gy/gmct sum-no			100			200			
Accredite te Numbe dards.con		4		NIST	SRM	9 3158									

Part # 57081 Lot # 062724

1 of 2

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com





https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

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9	20.02		A0.03	<0.2	10.02	505	<0.01	<0.02	3	<0.02	WINDER HURST	V CI IIICO	Varifics
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	Sc	011	2	Ru	N	ļ	R	Re	1	Ŗ		D CIM	No 1
	<0.02	20.02	3	<0.02	20.05	2	<0.02	<0.02	a cion	50.02		nav uur)	
	Ta	G	0	Sr	Na	5	Ag	S	Ş	2	And a state of the		
	<0.02	20.02	2	<0.02	202		<0.02	A0.02	101	c (h			
	3	20	2	ī	ЦI,		-	Te					
	40.02	20.02	2	40.02	<0.02	Þ	-1	<0.02	70.02	co c	COLUMN TWO AND ADDRESS OF THE OWNER.		
10 10 10 10 10 10 10 10 10 10 10 10 10 1	Zr	20	9	×	Υ _β	-	<	c					
	<0.02	40.02		40.02	40,02	20.02	3	40.02	<0.02	5			

(I) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Ser P. S.

Certified by:

* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. the preparation of all standards.

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 * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST
 * Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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Part # 57081 Lot # 062724

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT:	Part Number: 57023 Lot Number: 062424 Description: Vanadium (V)	Expiration Date: 062427			Volume shown below was diluted to (mL): 2000.3	Part Lot Dilution	Compound Number Number Factor	1. Ammonium metavanadate (V) 58123 021224 0.1000	[1] Spectrum No.1 [34.243 2.0E6		m/z->- 10 20	2.067	1.0巨7	m/z 110 120 1	2.588	
8:81 Ce					5E-05	0.06	Initial		200.0	sec]:58		30			190		200
Certified Reference Material CRM 冬」 シート					Balance Uncertainty	Flask Uncertainty	Uncertainty		0.084	34.243 sec]:58023.D# [Count] [Linear]		4			140		240
eference l	Lot #	24002546	2,0%		inty		Nominal	Conc. (µg/mL)	1000	žount) [Lin		5 0			- 50		2000
Naterial Cl	Solvent:	Nitric Acid	40.0 (mL)				Initial	Conc. (µg/mL)	10000.3	1⊖ar]		60			160		260
MF M6021			Nitric Acid				Final	Con	1000.0						j.		•
21		Alla	Formulated By:	M	Reviewed By:		Expanded		2.2			70			170		
		Alleah & Brack	J By:	2 l	y:		(Solve)		7803-55-6			80			180 0		
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Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

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Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

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Certified by:

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

- * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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